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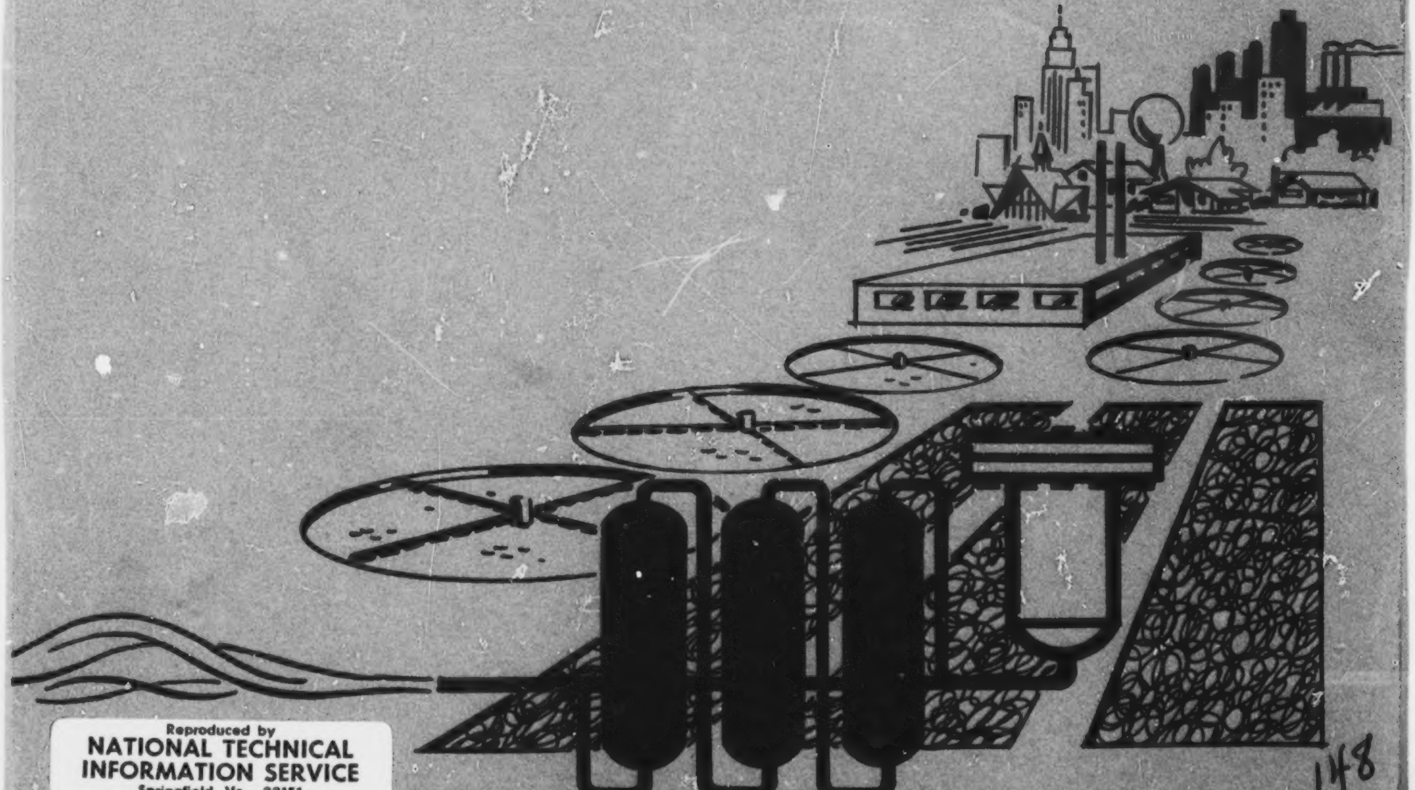
Phosphorus Removal with Pickle Liquor in an Activated Sludge Plant



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16. Abstract Hot waste pickle liquor (ferrous sulfate) as an iron source was successful in precipitating phosphorus from solution in a 115 mgd East Plant of Milwaukee's Jones Island Activated Sludge Wastewater Treatment Plant. An 85 mgd section of the plant receiving the same influent was operated as a control. East Plant effluent from January 12 to December 31, 1970 averaged 0.70 mg/l P, and the concentration was below the 0.5 mg/l P objective 55.1% of the time. Based on the 1970 average screened total soluble phosphorus concentration of 8.2 mg/l P, the East Plant with iron addition, achieved 91.3 % removals (0.70 mg/l P effluent residual), while the control West Plant removed 83.1% (1.4 mg/l P residual). For an average total concentration of 3.1 mg/l, the East Plant achieved 90.7% removal while the West Plant removed 67.5%. An average of 9.4 mg/l iron was added to the East Plant, but no optimum dosage was determined. Comparison of efficiencies of purification, pH, alkalinity, and microscopic examinations of the sludge microorganism indicated that the addition of unneutralized waste pickle liquor did not adversely affect purification processes. (Lowry-Texas)

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PHOSPHORUS REMOVAL WITH PICKLE LIQUOR IN AN ACTIVATED SLUDGE PLANT

by

Sewerage Commission of the City of Milwaukee
Milwaukee, Wisconsin 53201

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ENVIRONMENTAL PROTECTION AGENCY

Project #11010 FLQ

March, 1971

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ABSTRACT

The Milwaukee Sewerage Commission's Jones Island Waste Water Treatment Plant consists of a mutual primary treatment facility followed by two separate activated sludge plants. To enhance phosphorus removal in the 115 MGD East Plant, spent hot sulfuric acid pickle liquor (ferrous sulfate) was added for a one year test period. The 85 MGD West Plant was operated as a control.

The major objective of the iron addition was to maintain an East Plant effluent total phosphorus concentration of 0.50 mg/l P. The East Plant effluent total phosphorus concentration during the 1970 project period from January 12 to December 31, 1970 averaged 0.70 mg/l P representing 91.3% removal. The East Plant effluent total soluble phosphorus concentration averaged 0.30 mg/l P or 90.7% removal. Modification and automation of the iron addition which was completed in December 1970 will further reduce East Plant soluble phosphorus residuals.

Comparison of the efficiencies of the West and East Plants in removing BOD, COD and suspended solids as well as microscopic examination of the mixed liquors indicates that the addition of the unneutralized pickle liquor did not adversely affect purification.

Waste pickle liquor can be and is being utilized at the Milwaukee Jones Island Plant to enhance phosphorus removal. The principal problem experienced in maintenance of low effluent total phosphorus concentrations was the control of effluent suspended solids containing 2.61% P.

This report was submitted in fulfillment of Project Number 11010 FLQ, under the partial sponsorship of the Water Quality Office, Environmental Protection Agency.

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SECTION I

CONCLUSIONS

1. Waste pickle liquor (ferrous sulfate) as an iron source was successfully added to precipitate phosphorus in the 115 MGD East Plant at the Milwaukee Sewerage Commission's Jones Island Activated Sludge Waste Water Treatment Plant. An 85 MGD West Plant receiving the same screened raw sewage was operated as a control.

2. During the grant period from January 12 to December 31, 1970 the East Plant effluent daily total phosphorus concentration averaged 0.70 mg/l P and 55.1% of the time (195 days out of 354 days) the concentration was below the 0.50 mg/l P objective. During certain months the concentration was high because mixed liquor suspended solids were discharged into the effluent.

3. Based on a 1970 average screened sewage total phosphorus concentration of 8.2 mg/l P, the East Plant with iron addition removed 91.3% (0.70 mg/l P effluent residual) while the control West Plant removed 83.1% (1.4 mg/l P effluent residual).

4. Based on a 1970 average screened sewage total soluble phosphorus concentration of 3.1 mg/l P, the East Plant removed 90.7% (0.30 mg/l P effluent residual) while the West Plant removed 67.5% (1.1 mg/l P effluent residual).

5. An average of 9.4 mg/l iron was added to the East Plant mixed liquor (13,060 gallons/day at 0.71 pounds of iron per gallon) to effect the phosphorus removal. No optimum iron dose was determined.

6. The pickle liquor addition increased the return sludge phosphorus concentration from 2.29% in the West Plant to 2.61% as P in the East Plant, and increased the iron content from 1.86% in the West Plant to 5.08% as Fe in the East Plant.

7. Comparison of the efficiencies of the West and East Plants in removing BOD, COD and suspended solids as well as microscopic examination of the mixed liquors indicated that the addition of unneutralized pickle liquor did not adversely affect purification.

8. The pickle liquor (ferrous sulfate) addition increased the East Plant effluent soluble sulfate concentration by about 18% (123 to 145 mg/l SO_4) on the samples collected and decreased the alkalinity by 21% (213 to 169 mg/l as $CaCO_3$). The alkalinity of the East Plant mixed liquor was slightly less than the West Plant and the yearly average mixed liquor pH values were 7.0 and

7.1 respectively for the East and West Plants. The pickle liquor free acid which ranged from 2.1 to 5.8% H_2SO_4 for the A. O. Smith Corporation pickle liquor and from 6.6 to 9.3% H_2SO_4 for the U. S. Steel Corporation pickle liquor did not have any apparent effect on the plant operation.

9. The pickle liquor caused no problems with the plant physical facilities.

SECTION II

RECOMMENDATIONS

The results of this one year study have shown that it is not only feasible but practical to add waste sulfuric pickling liquor as a source of iron for phosphorus precipitation and removal at the Milwaukee Sewerage Commission's Jones Island Activated Sludge Plant. Since iron was added only to the 115 MGD East Plant, the next phase for demonstration and experimental purposes would be to add the pickle liquor to the 85 MGD West Plant.

This 1970 study indicated that pickle liquor addition did not adversely affect purification and was effective in maintaining low East Plant effluent phosphorus residuals. Addition of iron to the West Plant would increase phosphorus removal and subject the waste sludge dewatering facilities to a 100% iron addition. With the entire 200 MGD Jones Island Waste Water Treatment Plant receiving iron, the West Plant sludge characteristics will change as it did in the East Plant and should produce a sludge with a different ferric chloride demand. A study such as this would prove valuable if the waste water characteristics remain relatively the same. Since the present State of Wisconsin phosphorus removal requirement of 85% was obtained in 1970, the addition of iron to the entire plant is unnecessary except for experimental purposes.

Another consideration is to continue adding pickle liquor only to the East Plant. The iron probably affects other chemical removals in addition to the phosphorus. The 1970 project could be expanded to investigate the removal of the other chemicals of interest in water pollution and waste water treatment. Meters could be installed to accurately measure sludge production making it possible to determine the difference between the East Plant and the control West Plant using a mass balance. Also optimum iron requirements for phosphorus removal could be determined especially with the type of equipment presently installed and operating.

SECTION III

INTRODUCTION

In 1967 the Sewerage Commission of the City of Milwaukee initiated a three year research program to evaluate the phosphorus removal in the Jones Island Activated Sludge Plant. This research program, funded in part by the Water Quality Office, Environmental Protection Agency, included studying methods to enhance phosphorus removal. The theories of biological phosphate removal as stated by Levin and Shapiro (1), Vacker et al.(2) Borchardt and Azad (3) and Wells (4) along with the chemical precipitation theories contended by Menar and Jenkins (5) were reviewed and attempts were made to maximize biological precipitation of phosphorus in the activated sludge plants. The 200 MGD Jones Island Plant consisting of the 85 MGD West Plant and the 115 MGD East Plant operated in parallel receiving a common screened sewage was ideal for plant wide variation of operating parameters to effect phosphorus removal.

In 1968 the Sewerage Commission of the City of Milwaukee and the Water Pollution Control Corporation of Milwaukee, conducted a plant scale study to enhance phosphorus removal by chemical precipitation using aluminum and iron salts at a small activated sludge plant (40-70,000 gallons per day) located in a contract area of the Metropolitan Sewerage District. This work, at a plant receiving only domestic wastes from a small subdivision, expanded the pilot plant work done by Barth and Ettinger (6). Following successful phosphorus removal with both sodium aluminate and alum, iron in the form of ferrous sulfate was added. The A.O. Smith Corporation, who joined the study at this point, supplied the iron in the form of a neutralized waste pickle liquor and also furnished laboratory services. The conclusions of the May 1968 to January 1969 study indicated that the aluminum or iron addition, to remove phosphorus, was an effective and economical method to enhance phosphorus removal.

Concurrent research being conducted at the Sewerage Commission's Jones Island plant to relate operating parameters to phosphorus removal indicated that 60 to 90% total phosphorus removal could be expected but control of plant operations to consistently remove 85% of the phosphorus as required by the State of Wisconsin Department of Natural Resources could not be accomplished. Supplementary cationic precipitation of phosphorus in conjunction with the activated sludge process was therefore investigated. Iron was chosen as the cation to be used because of the availability of pickle liquor from the A. O. Smith Corporation, the cooperative attitude of the company, the success experienced at the small activated sludge plant study and the relative costs of the chemicals.

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In September 1968, Mr. George Hubbell (7) reported on his federal grant activities to remove phosphorus from Detroit's waste water. He indicated the phosphorus removal was achieved through chemical precipitation using iron in a pilot plant. In May 1969 representatives of the Milwaukee Sewerage Commission went to Detroit to observe the operation and discuss the project with Dr. Albert M. Shannon, Chief of Water and Sewage Treatment. This information, combined with the previous Sewerage Commission work, indicated that iron addition to a portion of the Jones Island plant was the next logical step.

When a decline in phosphorus removal occurred in June of 1969 as a result of the Milwaukee Brewery strike it was decided to add neutralized pickle liquor, from the A.O. Smith Corporation, to one East Plant aeration tank to observe the effects upon phosphorus precipitation and on the mixed liquor biota. This test indicated that the iron effectively reduced the effluent phosphorus concentration with no noticeable ill effects on the treatment process or equipment. An addition rate of 15 mg/l of iron to the mixed liquor was found to maximize phosphorus removal. Neutralization of the pickle liquor free acid (2-5%) was not necessary.

After the plant returned to normal operation following the five week brewery strike (June 9 to July 15), unneutralized waste pickle liquor was added to the entire 115 MGD East Plant from November 3 to November 14, 1969. The pickle liquor was trucked to the Jones Island plant by the A.O. Smith Corporation and about 20,000 gallons of the liquor was added to the mixed liquor aeration tank feed channel each day. The plant scale test confirmed the single tank studies. At this point, the Sewerage Commission of the City of Milwaukee applied for a federal demonstration grant to assist in covering the cost of a one year plant scale study to add pickle liquor to enhance phosphorus removal. The A.O. Smith Corporation agreed to construct and maintain pickle liquor storage and addition facilities and to deliver the waste pickle liquor to the Jones Island plant.

SECTION IV

OBJECTIVES

The objectives of the pickle liquor iron addition to the 115 MGD East Plant included:

A. Evaluate the effectiveness of continuous iron addition to maintain an effluent total phosphorus concentration of 0.50 mg/l P or less.

B. Compare the efficiency of the West and East Plants in removing phosphorus, BOD, COD and suspended solids.

C. Determine the optimum iron requirements to maximize phosphorus removal.

D. Determine the effects of iron addition on the mixed liquor biota and its settling characteristics.

E. Determine the effects of iron addition on the plant physical facilities.

F. Determine the effect of iron addition on the waste sludge conditioning ferric chloride requirements.

SECTION V

SEWERAGE COMMISSION OF THE CITY OF MILWAUKEE

JONES ISLAND PLANT (8, 9)

The Jones Island activated sludge waste water treatment plant is designed to treat 200 million gallons of sewage daily. The plant consists of the original 85 MGD West Plant and a 115 MGD East Plant addition operated in parallel and receiving the same raw screened sewage. The treatment plant has a connected population of about 1,000,000 people. The service area includes about 17,000 acres of a combined sewer system and about 83,000 acres having a separate sanitary sewer system.

The primary treatment facilities consist of conventional coarse screening (mechanically cleaned bar screens, 1" between bars) to remove hair, fleshings, garbage, rags, wood etc. Following coarse screening, the waste water is directed to the grit chambers consisting of eight 8 x 8 x 90 foot long compartments to reduce the flow velocity to one foot per second. At this reduced flow rate the grit consisting of sand, gravel, coal, ashes and some organic solids, is deposited on the bottom.

Following this treatment, the waste water is directed to rotary drum fine screens (3/32 inch slots - 2 inches long) to remove troublesome solids before the waste water is divided between the West and East conventional activated sludge plants for treatment.

The West Plant has a ridge and furrow-type aeration plate arrangement in the 24 aeration tanks. The tank arrangement allows the mixed liquor to travel through 472 feet of aeration tank (22 feet wide, 15 feet deep) prior to flowing into one of the 11 - 98 foot diameter sedimentation tanks. The East Plant has twenty aeration tanks where the mixed liquor travels through 740 feet of tank length (22 feet wide and 15 feet deep). These tanks have a longitudinal plate arrangement (10, 11). This plant has ten sedimentation tanks each consisting of two adjoining 84 foot diameter tanks. In both plants the return sludge volume added to the screened sewage is about 25% of the sewage volume but occasionally, the return sludge volume has been increased to 35%.

The aeration tanks in both plants are designed to aerate the mixed liquor (screened sewage plus return sludge) for an average period of six hours varying from four to eight hours over minimum and maximum flow rates. The aerated mixed liquor is then directed to the final sedimentation tanks for an average of a two hour detention time (the surface settling rate for West and East Plants are respectively 900 and 870 gpd / sq ft at design flow) where the settled sludge is drawn from the bottom of the base and the effluent is discharged over a series of weirs into Lake Michigan.

The mixed liquor solids that are wasted from both the West and East Plants are directed to one of six gravity thickeners located in the West Plant. The thickened waste sludge is conditioned with ferric chloride, filtered on vacuum filters, dried in rotary dryers and sold as a fertilizer called Milorganite. This is the only way sludge can be removed from the plant. During 1970 a total of 71,500 tons (dry basis) of solids were removed in the dewatering plant. The physical layout of the Jones Island Plants is shown in Figure 1.

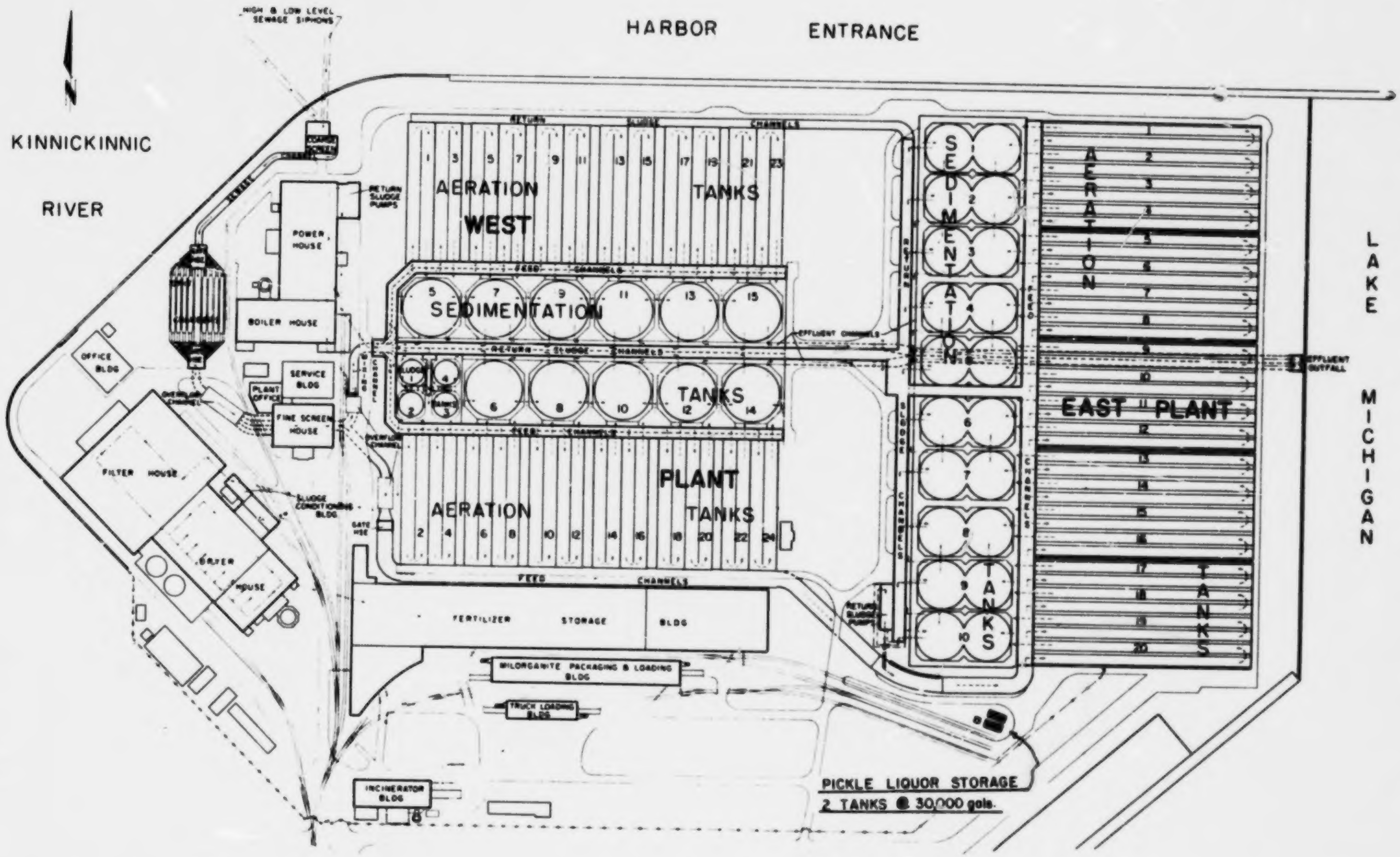

Figure 1

Jones Island Waste Water Treatment Plant

SECTION VI

JONES ISLAND PLANT OPERATION

The Milwaukee Metropolitan area, serviced by the Jones Island Waste Water Treatment Plant, contains a variety of industries and the liquid wastes vary from low strength metal-working wastes to the concentrated organic wastes contributed by the large brewing industries. During 1970, the average daily waste water volume received was 171.9 mgd, having a BOD content of 209 mg/l. The average weekday flow (industrial and domestic) was 181.2 mgd with a BOD of 237 mg/l and the Sunday flow (essentially domestic) was 143.4 mgd with a BOD of 114 mg/l. Calculations from this data indicate that 21% of the flow is from industry along with 52% of the BOD contribution.

With this type of load on a waste water treatment plant, many changes are necessary to maintain an efficiently operating plant and many problems can be experienced. The following review discusses the monthly operational conditions and changes made in 1970.

January: The average sewage flow that entered the plant was 157 mgd and was divided, directing on an average, 46% to the West Plant and 54% to the East Plant. From the 4th to the 6th, the sludge dewatering facilities were shut down for scheduled maintenance (this is usually done once or twice a year as necessary). Prior to the dewatering plant shutdown, the mixed liquor suspended solids concentration was reduced and during the shutdown period, the mixed liquor suspended solids that are normally wasted, were recycled and permitted to build up within the system.

During 1969 an uncontrollable growth and froth formation, identified as Actinomycetaceae Genus Nocardia would periodically develop on aerated mixed liquor and return sludge channels (see Appendix A). The 1969 appearance was the first observed at this plant and it was restricted to the East Plant. The third occurrence appeared in both plants in December, 1969 and continued into January, 1970. Some of the aeration tanks were as much as 80% covered with the froth that was present in both the West and East Plants. The mixed liquor food (BOD) to microorganisms (MLVSS) ratio remained low because of the shutdown which was probably responsible for the continued presence of the froth, although information received from other treatment plant operators indicated that the froth comes and goes without any known reason.

February: The average sewage flow that entered the plant was 158 mgd with an average distribution of 50% to each plant. The distribution was adjusted and six of the twenty (30%) East Plant aeration tanks were taken out of service to increase the food to microorganism ratio in an attempt to eliminate the Nocardia froth. By the end of the third

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week, the froth had practically disappeared and the plant operation continued under these conditions to determine if these changes caused the disappearance of the Nocardia froth.

March: The distribution of the average 161 mgd of sewage that entered, averaged 50% to each plant. The six idle East Plant aeration tanks were returned to service on the 6th, resulting in an East Plant loading 30% less than the West Plant. The Nocardia froth had not returned, but patches of a white foamy substance formed on the aeration tanks in both plants. This substance has an irridescent cast and appears to be a detergent type foam of air, water and some grease solids. The greater the solids concentration, the browner the color. The Jones Island laboratory was not equipped for any detailed analyses of the foam.

April: The 50 - 50% sewage distribution was continued until April 27 when it was changed to 45% to the West Plant and 55% to the East Plant. The distribution of the sewage, averaging 172 mgd, resulted in an East Plant loading 25% less than the West Plant for the majority of the month. The distribution was changed because of overloaded West Plant sedimentation basins and sludge settling problems. These changes resulted in overloaded sedimentation basins in both plants. This overloading caused a MLSS discharge into the effluents which effects the results of analyses of effluent samples making the data on these days unuseable as a plant performance indicator. The white foam was still present.

May: The sewage distribution was changed several times resulting in a 46% West Plant - 54% East Plant average distribution of the 173 mgd flow. Problems were still experienced with overloaded sedimentation basins, but generally, the performance of both plants was good. The white foamy substance was present until the return of the Nocardia froth to the East Plant on the 18th. Only the white foam was present in the West Plant.

A problem of filter cake cracking was experienced while the cake was under vacuum resulting in a vacuum loss. The present vacuum pumps did not have enough capacity to maintain the vacuum. The filter cake cracking occurred during a period when the greatest portion of the waste sludge originated from the East Plant. This resulted in no major problems and lasted for only several hours. The cracking probably resulted from the increased sludge ash caused by the higher ash content of the East Plant sludge and the ash washed into the combined sewer system with the heavy rains experienced during this period.

June: The 182.7 mgd of sewage that entered the plant was distributed 44% to the West Plant and 56% to the East Plant. The sedimentation basins were again periodically overloaded because solids could not be removed fast enough to keep up with the biological solids production.

The Nocardia froth covered from 20 to 70% of the East Plant aeration tank surface, but only a trace was noted in the West Plant. By the 15th, most of the froth disappeared but the white foam returned to both plants.

July: The distribution of the 176 mgd of sewage averaged 41% to the West Plant and 59% to the East Plant. Two sludge dewatering plant shutdowns were scheduled. The first shutdown was from the 6th to the 8th for major maintenance repair and the second was for a few hours on the 22nd to make additional equipment adjustments. As a result of these shutdowns, the sedimentation basins became overloaded with MLSS discharged into the effluent. The white foam was still present in both plants.

August: No major problems were experienced and excellent plant operation was obtained. The 173 mgd of sewage was distributed 43 - 57% respectively to the West and East Plants. Filter cake cracking was noticed for a short period of time, but was eliminated when more West Plant sludge was blended into the waste sludge. The white foam was still present in both plants.

September: A distribution of 43 - 57% to the West and East Plants was maintained for the average 188 mgd of sewage that entered the plant. Sedimentation basins became overloaded again and the white foam was still present with larger patches noted on some of the aeration tanks.

October: The 172 mgd of sewage flow was distributed 45 - 55% respectively to the West and East Plants. More sewage was directed to the West Plant because of a mechanical failure and resultant damage to one East Plant double sedimentation basin (10% of the East Plant capacity). This loss in capacity resulted in the discharge of MLSS into the effluent. The white foam and some brown foam was present on the aeration tanks in both plants.

November: A 43 - 57% sewage distribution to the West and East Plants was maintained with the 175 mgd. High mixed liquor suspended solids concentration occurred resulting in a low food to microorganism ratio. Not only did the reduced sedimentation basin volume become overloaded, but by the 24th, channel surfaces were covered with a large quantity of Nocardia froth.

December: The 175 mgd of sewage was distributed 44% to the West Plant and 56% to the East Plant. Again, the sedimentation basins were overloaded. The Nocardia froth build-up was so great that physical removal was necessary. The froth finally disappeared and the white foam returned.

SECTION VII

IRON ADDITION EQUIPMENT AND OPERATION

The facilities proposed for addition of waste pickle liquor iron for enhancement of phosphorus removal were designed to make possible a precise and reliable operation (12, 13). The equipment was comprised of 2 - 30,000 gallon pickle liquor storage tanks insulated so that only a 1°F maximum temperature drop per day would occur at an ambient temperature of minus 20°F. The automatic equipment would consist of an automatic feed valve, a specific gravity column, a calculator, a recirculation pump through a heater, and an equipment by-pass. The calculator would summate the mixed liquor flow from the existing meters, determine the iron concentration from the specific gravity, and control the iron addition to maintain the desired iron concentration. Deliveries on equipment were the only delaying factor. The A. O. Smith Corporation agreed to design, construct and maintain the pickle liquor facilities and deliver the waste pickle liquor to the Jones Island site.

On Wednesday January 7, 1970 the first truck load of pickle liquor from the A. O. Smith Corporation was delivered to Jones Island starting the first addition during the grant period. Initially the hot pickle liquor (125°F) was drained from each truck tanker through an insulated, heated hose and a flow meter into the East Plant screened sewage channel just upstream from the return sludge addition (this point of addition would be changed when the pickle liquor storage tanks were ready for use). The outside temperatures were below 0°F which created many problems with crystallization of ferrous sulfate. These crystals plugged the tanker valves, hose and flow meter. The construction of a shelter around the flow meter with heat lights was not enough to prevent plugging. Pickle liquor was added continuously for five days each week starting 7:00 A.M. on Monday and ending 5:00 A.M. on Saturday.

During the second week of addition one truck was set up as the feed source and was blanket insulated, covered with canvas and heaters were placed under the covered area to prevent cooling and crystallization of the pickle liquor. The hauling truck brought hot pickle liquor from the A.O. Smith Corporation 10 miles to the stationary feed truck on Jones Island. Compressed air was used to transfer the liquid from the delivery truck to the stationary tanker. The flow meter was eliminated and a plastic garbage bucket was used to measure the pickle liquor flow rate. This method proved to be very accurate in measuring the flow rate. For the first two weeks an objective addition of 15 mg/l of iron in the East Plant mixed liquor was attempted. On January 23 the rate was decreased to 10 mg/l of iron. Initially pickle liquor was added independent of the specific gravity (iron concentrations) and independent of the mixed liquor flow. This rough

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method of addition however, worked fairly well. During January, pickle liquor was added on eighteen days to the mixed liquor with averages of 12.8 mg/l of iron per day. This resulted in an initial daily addition of approximately 11,800 lbs of iron in an average of 17,400 gallons of pickle liquor per day.

To more efficiently control the iron addition, a chart was prepared to specify the gallons per minute of pickle liquor to be added over a certain specific gravity range assuming a constant average mixed liquor flow rate (see Appendix B for sample of one of the charts used). This was started on February 19 in an attempt to accurately add 12 mg/l of iron. On March 16 the rate of iron addition was increased from 12 to 15 mg/l to increase the phosphorus removal, further saturate the return sludge with iron and compensate for not adding iron on the week ends. Monday sewage has been characteristically high in phosphorus as a major day for washing clothes and more iron was added hoping to sustain a surplus.

On June 1, 1970 the two - 30,000 gal. pickle liquor storage tanks and piping were ready for use. This streamlined the delivery scheduling making it possible to add pickle liquor continuously seven days per week. This resulted in a change of location of pickle liquor addition to the mixed liquor channel about 55' downstream from where the return sludge is added to the sewage. The pickle liquor was added manually utilizing the automatic equipment by-pass piping. The gallons per minute addition of pickle liquor was still determined by using a bucket measurement. The pickle liquor stainless steel recirculation pump was put in operation on June 21 and overnight it started leaking, spraying pickle liquor all over the control house. In addition to losing a few thousand gallons of pickle liquor, some of the electrical equipment was damaged. The cause of the failure was traced to an "iron" plug that was dissolved out of the stainless steel pump body by the acid.

The pickle liquor addition rate in June was modified to better control the pickle liquor added in proportion to the phosphorus concentration and therefore less was added during the night time (10 mg/l during the day and 8 mg/l at night). On Monday July 13 the pickle liquor was found crystallized in the piping system stopping the flow of iron into the plant for an undetermined number of hours over the week end. Manipulation of the valves freed the system. The piping at this time was not yet insulated but was scheduled for the near future. Again on July 29 the piping system was plugged but this was caused by sludge accumulation in the piping. In September a new recirculation pump was also installed and put in continuous operation. This pump operated from the 11th to the 29th before leaking pickle liquor all over the floor.

The Fischer & Porter Company was to have made delivery of this automatic equipment by mid June but they indicated that some of the parts had been delayed and the entire package of equipment was not received until September. During their installation and inspection, a circuit board was burned out and had to be returned to the factory. The repaired circuit board was returned in October and the automatic pickle liquor control system was put in operation but electrical problems caused the automatic valve to close unexpectantly. Another signal problem resulted from open circuits in the Sewerage Commission's mixed liquor flow rate meters causing an infinite mixed liquor flow reading and response.

Concern was shown by the A.O. Smith Corporation as to their ability to supply the East Plant with enough pickle liquor during the period of the General Motors automotive workers strike. Pickling activity at the A.O. Smith Corporation was considerably reduced and the pickle liquor supply was basically from an old storage pond at the company. The material from this pond had a low iron content and the situation became critical to a point where an additional source of iron had to be found. The U. S. Steel Corporation, Waukegan, Illinois Works, was contacted and their management agreed to have their sulfuric-hydrochloric pickle liquor delivered. Tests were conducted and it was felt that the low chloride content in the U. S. Steel Corporation pickle liquor would not appreciably damage the stainless steel during this interum period. The first truck load of U. S. Steel pickle liquor was delivered on November 4 and a total of 53 truck loads (235,000 gallons) were delivered through December 1st when the A.O. Smith Corporation was again producing enough pickle liquor to meet the demands.

During November and December, work was done in an attempt to start up the automatic equipment. After additional changes and parts replacement in the equipment, the unit was put in operation on December 11. Final adjustments still remain and will be made in the near future. This equipment will make it possible to set a desired iron concentration in the mixed liquor and the equipment will automatically control the rate of addition. Figure 2 shows the unit in operation and Figure 3 shows one of the A.O. Smith Corporation tanks being unloaded.

The equipment and materials used for the construction of the facilities designed for pickle liquor addition to the 115 mgd East Plant were:

1. Two 30,000 gallon steel tanks 12 foot in diameter and 36 foot long were rubber lined and the outside was insulated with a cover of urethane foam and painted aluminum. Both tanks were equipped with a low level alarm which actuated a red light and a high level alarm which activated a horn. The pickle liquor was transferred from the tanker to the storage tanks using air pressure.

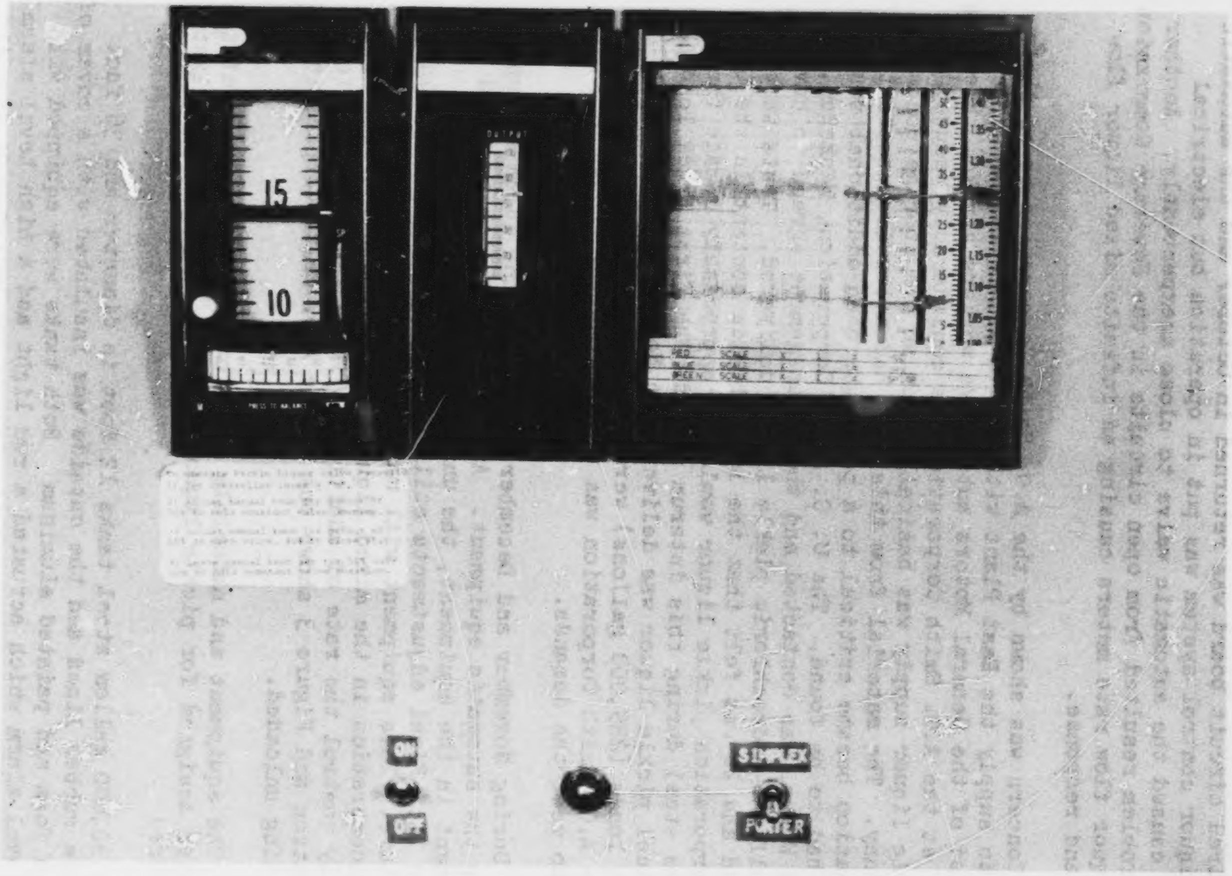

Figure 2

Automatic Pickle Liquor Addition Equipment

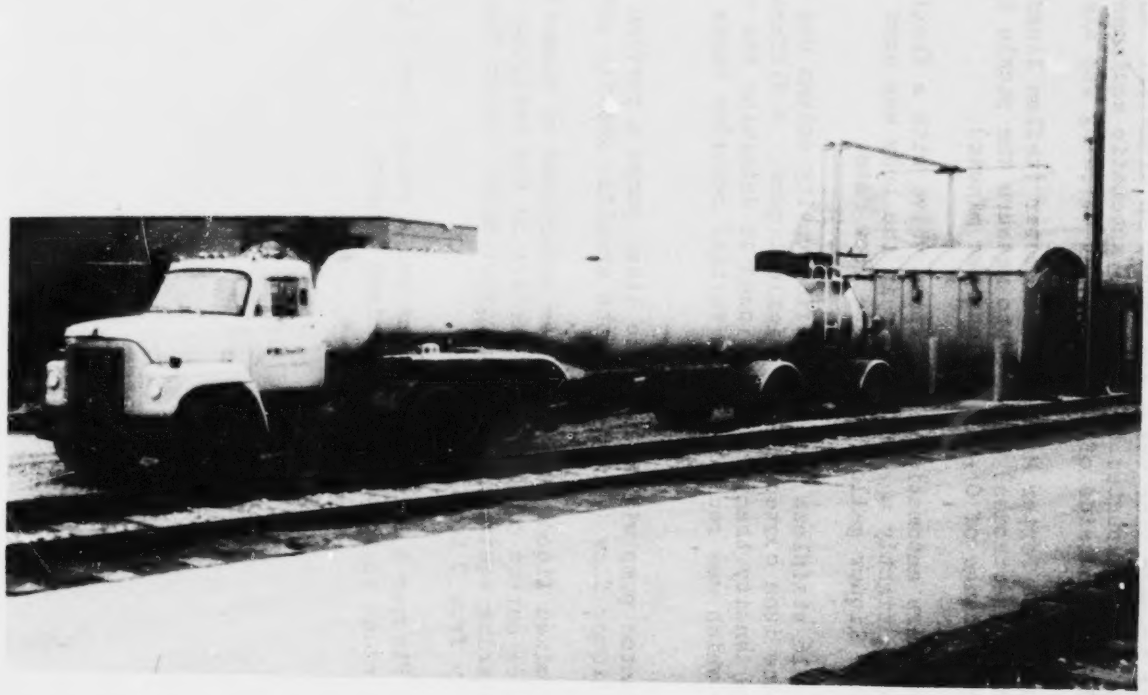

Figure 3

Transferring Pickle Liquor into Storage Tank

2. All the piping and valves were 316 stainless steel which was resistant to the sulfuric acid pickle liquor. The piping from the tanks was 4 inches in diameter and then reduced to 2 inches as it passed through the equipment and then returned to 4 inches. The equipment by-pass line was 1 1/4 inches in diameter. An 8' x 10' building was constructed to house the automatic equipment. The piping located outside of the equipment building was also insulated.

3. A Fischer & Porter Magnetic flow meter (teflon lined with Hastelloy C electrodes) was used to measure the pickle liquor flow rate (chart range of 0 - 50 gallons per minute).

4. A Saunders automatic rubber lined valve with a flexible diaphram which seats tightly against a weir in the body was used to control the pickle liquor gallon per minute flow rate.

5. The 316 stainless steel specific gravity column was used to obtain the iron content of the pickle liquor. A differential pressure density transmitter was used to determine the specific gravity which was recorded. The initial recorder range was 1.00 to 1.40.

6. A Vanton pump with a neoprene liner pumps a portion of the pickle liquor flow (0.3 gpm) to the specific gravity column.

7. The mixed liquor flow rate was determined by summating the resistance output of 20 potentiometers on the exisitng East Plant tank metering equipment. The recorder mixed liquor flow range was initially from 0 to 240 mgd.

8. The Fischer & Porter equipment had a range from 0 to 25 mg/l of iron added to the East Plant mixed liquor.

SECTION VIII

SAMPLING & ANALYTICAL TECHNIQUES

SAMPLING:

Sewage:

The daily sewage samples analyzed represent 24 hour composite samples of fine screened sewage from 7:00 A. M. to 7:00 A. M. A Phipps-Bird sampler was used to collect samples to form hourly composites (30-200 ml portions per hour) which in turn were composited to form a 24 hour composite in proportion to the screened sewage flow rate.

Effluents:

The West Plant effluent samples represent a 24 hour composite of hourly grab samples. Every hour the operator would take one dipper full of effluent from each weir channel on all of the eleven clarifiers. Each hourly sample was mixed and a volume in proportion to the sewage flow was added to the 24 hour sample bottle.

In the East Plant the same effluent sampling schedule as the West Plant was used until April 1, 1970 when an automatic Sonford sampler was put into operation. This sampler was activated by a timer set in proportion to the average flow rate.

Mixed Liquor:

The SDI analyses were performed on individual mixed liquor grab samples taken at about 9:30 A.M., 5:30 P.M. and 1:30 A.M. each day from a feed channel to the sedimentation basins and the results were averaged. The mixed liquor pH was determined on the 9:30 A.M. grab sample. The MLSS analysis was performed on a 24 hour composite mixed liquor sample. Equal volumes of mixed liquor were collected every hour for each shift and composited on a shift basis in proportion to the average shift flow rate variations.

Return Sludge:

Equal volumes of return sludge were collected every two hours for each shift. At the end of the shift the sample was mixed and a designated volume was added to the 24 hour return sludge sample bottle. This designated volume was proportional to the average flow variation for each shift.

Milorganite:

A Milorganite sample was collected in direct proportion to the rate of production to produce a 24 hour composite.

ANALYTICAL TECHNIQUES:

Phosphorus Determinations:

Total, total soluble, and soluble ortho phosphorus concentrations were determined on liquid samples. After the filtration of the total soluble and soluble ortho samples and the ternary acid digestion of the total and total soluble sample, the prepared samples were introduced into a Technicon Autoanalyzer for determination of the soluble ortho phosphorus concentration using the Aminonaphtholsulfonic Acid Method. For a detailed description of the method refer to Appendix C. The return sludge phosphorus analyses was a gravimetric method as outlined in Appendix D.

Iron Determination:

The total iron and total soluble iron (analyses on filtrate) determination made on sewage and effluent samples were prepared by a nitric acid digestion. Soluble iron determinations on mixed liquor samples were handled in a similar manner. The digested samples were introduced into an Atomic Absorption instrument (Instrumentation Laboratory, Incorporated, Model No. 153) for analyses. The sewage sample for total iron was diluted 1 to 2 but the rest of the samples were run direct. During the initial stages in the operation of the atomic absorption unit, (January, February and March) problems were experienced by using ternary acid for digestion, making too many dilutions and an improper calibration and use of blanks for background correction. Therefore, the iron data for this initial period is approximate but still presented in Appendix H.

The iron concentration in the pickle liquor was determined using a volumetric titration-dichromate process. A description of the method is in Appendix E.

The return sludge iron was determined on dry centrifuged solids using a volumetric dichromate method as given in the Appendix F.

Mixed Liquor and Return Sludge Suspended Solids Concentration Determination:

A known volume of the sample was filtered through a weighed filter paper in a Büchner funnel (100 mls of ML through a S & S Sharkskin and 50 mls of return sludge through a Whatman No. 3). The sludge and paper were dried at 103° C for one hour, cooled and weighed again. The difference in weight was used to determine the concentration.

Sludge Density Index Determination:

A relatively fresh mixed liquor sample was used for this analysis. The suspended solids concentration was determined on one part and a 30 minute settling test was determined on another part using a 1000 ml graduated cylinder.

$$\text{SDI} = \frac{\%\ \text{MLSS} \times 100}{\%\ \text{Cylinder volume occupied by solids after 30 minutes}}$$

Biochemical Oxygen Demand Determination:

This determination involved using the azide Modification of the Iodometric method as given in Standard Methods 12th Edition (14). The method for rounding off the effluent data was changed in September as indicated in the presentation of the daily results.

Chemical Oxygen Demand Determination:

The sewage (20 ml aliquot) and effluents (40 ml aliquots) were analyzed for COD using the method as explained in Standard methods. 12th Edition (14).

Total Solids Determination:

A 100 ml sample of sewage or effluent was placed in tared silica dish and the liquid was evaporated to dryness on a water bath. Then the dish was dried in an oven at 103°C and was put in a desiccator to cool prior to being weighed again. The difference was the total solid weight per 100 ml of sample. The method is from Standard Methods, 12th Edition (14).

Suspended Solids Determination:

The sewage (50 ml) and effluent (200 ml) samples were filtered through a tared Gooch crucible with an asbestos pad. The crucible was dried at 103°C for one hour cooled in a desiccator and weighed again and the difference was the suspended solids weight. The method is from Standard Methods, 12th Edition (14).

Nitrogen Determination:

The total Kjeldahl nitrogen analysis on the liquid samples (sewage and effluents) is as indicated in Standard Methods 12th Edition (14).

The nitrogen analyses on the Milorganite and the dry centrifuge return sludge solids is a method for total nitrogen on dried solids explained in Appendix G.

Ash Determination:

A three gram sample of the dried solids were put in a tared crucible and ignited at 600° C. for two and one half hours, cooled in desiccator and weighed.

Alkalinity Determination:

A 50 ml sample was titrated to a pH of 4.3 using N/50 H_2SO_4 using the following calculation as in Standard Methods, 12th Edition (14).

$$\text{Alkalinity as mg/l } CaCO_3 = \frac{\text{mls } H_2SO_4 \times \text{Normality } H_2SO_4 \times 50{,}000}{\text{mls sample}}$$

Sulfates Determination:

The sewage and effluent samples (20 mls diluted to 100 mls with distilled water) were analyzed for soluble sulfate by first filtering the sample through a glass fiber pad and running the analyses on the filtrate. The Turbidimetric Method as in Standard Methods, 12th Edition (14) was used.

Specific Gravity Determination:

A standard 60° F. hydrometer was used to measure the specific gravity of the pickle liquor. The readings were not compensated for temperature.

% Free Acid Determination:

Initially, a 10 ml aliquot of the pickle liquor was titrated with 1N Na OH until the formed floc turned from green to brown (pH about 6.0). This method was used for all the analyses on pickle liquor from the A. O. Smith Corporation. This method was later changed to titrate to a pH of 4.3 and all the pickle liquor from the U. S. Steel Corporation was analyzed in this fashion. The formula used in all determinations was:

$$\% \; H_2SO_4 = \frac{\text{mls titrant} \times \text{Normality of NaOH} \times 49}{\text{mls sample} \times \text{Specific Gravity}}$$

SECTION IX

PRESENTATION AND DISCUSSION OF DATA

A. Screened Sewage and Effluent Characteristics

The review and investigation of the performance of a waste water treatment plant was greatly dependent upon the characteristics of the waste water that enters the plant. Some of these characteristics of the raw screened sewage entering the secondary or biological portion of the Jones Island treatment process presented as 1970 yearly averages are:

TABLE 1

Yearly Average Screened Sewage Characteristics

Total Solids, mg/l	939
Suspended Solids, mg/l	207
BOD, mg/l	209
COD, mg/l	431
Kjeldahl Nitrogen mg/l N	28.3
Total Phosphorus, mg/l P	8.2
Total Soluble Phosphorus, mg/l P	3.1
Total Iron, mg/l Fe	7.17
Total Soluble Iron, mg/l Fe	0.60

These properties of the sewage entering the plant are further broken down into monthly average concentrations on Table 2. The West and East Plant operations are similar except iron was added to the East Plant. Table 2 also indicates the quality of the effluent from both plants along with the percent removal of the different properties listed. Appendix H has all the daily results of analyses.

The data shows some very significant and interesting information. The sewage has a relatively high percent of insoluble phosphorus, 62% or 5.1 mg/l P. The pickle liquor iron, therefore only has to interact and precipitate the smaller portion of the phosphorus (38% soluble). Figures 4, 5 and 6 show the monthly variations in screened sewage BOD, suspended solids and total phosphorus over the last six years. The year 1970 is far from an average year and at the present time no substantial answer was available that could explain the marked change experienced. The sewage properties in the future may continue as in 1970 making the plant data obtained during this grant period typical or it may return to the earlier characteristics making 1970 an "unusual year".

TABLE 2*

MONTHLY AVERAGE SCREENED SEWAGE AND EFFLUENT CHARACTERISTICS

MONTH	BIOCHEMICAL OXYGEN DEMAND					CHEMICAL OXYGEN DEMAND				
	mg/l			% Removal		mg/l			% Removal	
	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
January	251	16.6	12.9	92.5	94.6	505	81	67	82.7	85.9
February	249	13.0	14.0	94.2	93.9	499	86	78	81.7	83.5
March	244	12.5	22.9	94.2	89.4	476	85	79	80.7	82.3
April	203	9.0	11.4	95.3	93.8	443	77	67	81.6	84.0
May	192	12.8	12.9	93.2	92.6	420	83	66	79.5	83.3
June	183	7.4	24.8	95.6	85.9	395	55	81	85.9	79.8
July	174	14.6	15.5	91.0	90.5	377	60	63	83.4	82.6
August	171	8.7	10.3	94.1	93.1	368	54	61	84.3	82.0
September	187	12.6	14.4	92.4	91.5	377	52	65	85.1	81.9
October	230	17.0	23.0	92.4	89.4	450	65	81	84.9	81.2
November	210	13.0	15.0	93.5	92.5	440	56	64	86.5	84.6
December	210	13.0	18.0	93.4	91.3	420	61	71	84.1	82.0
Average	209	12.5	16.3	93.5	91.5	431	68	70	83.4	82.8

Month	TOTAL SOLIDS					SUSPENDED SOLIDS					KJELDAHL NITROGEN		
	mg/l			% Removal		mg/l			% Removal		mg/l as N		
	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE
January	1077	801	803	25.4	26.6	259	22	16	90.5	93.8	34.3	15.9	15.1
February	990	722	756	26.4	22.9	230	15	16	93.4	92.8	33.2	14.1	14.4
March	1038	765	794	25.9	23.1	230	17	18	92.2	91.9	29.9	12.2	11.4
April	1033	773	807	24.5	21.2	214	18	13	91.5	93.5	27.3	9.0	7.6
May	944	736	746	21.5	20.1	193	27	16	86.4	91.2	26.1	10.0	6.4
June	885	694	772	21.4	12.8	177	13	41	92.6	77.1	24.3	8.1	7.5
July	805	639	681	20.8	15.2	177	22	23	87.3	87.5	24.9	7.9	4.3
August	805	629	666	21.1	17.1	177	12	14	93.2	91.7	25.9	9.9	5.0
September	828	649	693	21.2	16.9	189	15	23	91.8	87.9	24.5	8.1	4.5
October	918	715	756	21.5	17.6	232	22	42	90.3	81.0	30.7	12.5	10.3
November	928	738	769	19.8	17.3	199	18	25	91.2	87.7	28.6	12.1	7.1
December	1017	829	860	18.0	15.5	207	21	29	90.0	85.5	29.9	11.4	10.0
Average	939	724	759	22.3	18.9	207	18.5	23	90.9	88.5	28.3	10.9	8.6

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*All effluent data represents the period from January 12 to December 31, 1970.

TABLE 2 (cont.)

MONTHLY AVERAGE SCREENED SEWAGE AND EFFLUENT CHARACTERISTICS

MONTH	TOTAL PHOSPHORUS					TOTAL SOLUBLE PHOSPHORUS				
	mg/1 as P			% Removal		mg/1 as P			% Removal	
	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
January	9.7	3.0	0.64	69.1	93.4	3.9	2.6	0.37	34.2	91.1
February	10.4	2.5	0.86	75.4	91.2	3.8	2.1	0.57	44.4	84.9
March	9.6	2.2	0.86	76.6	90.8	3.7	1.9	0.59	47.0	83.7
April	8.3	1.6	0.52	81.1	93.4	3.6	1.3	0.34	65.2	90.8
May	7.3	1.1	0.49	85.2	93.4	2.8	0.55	0.22	80.5	92.2
June	6.7	1.1	0.96	83.6	85.4	2.6	0.91	0.23	66.6	90.9
July	7.2	0.97	0.70	86.5	90.5	2.5	0.46	0.19	80.4	92.5
August	7.3	0.66	0.34	91.1	95.5	2.7	0.35	0.20	87.2	93.2
September	6.8	0.72	0.58	89.2	91.3	2.5	0.45	0.27	81.4	89.7
October	8.9	1.2	1.1	86.2	87.5	3.1	0.80	0.26	74.0	91.1
November	8.1	0.94	0.56	88.7	93.1	2.8	0.59	0.14	79.3	94.7
December	7.7	1.2	0.77	84.0	90.2	2.7	0.83	0.17	69.3	93.4
Average	8.2	1.4	0.70	83.1	91.3	3.1	1.1	0.30	67.5	90.7

MONTH	TOTAL IRON					TOTAL SOLUBLE IRON				
	mg/1 as Fe			% Removal		mg/1 as Fe			% Removal	
	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
January	8.43	0.67	0.91	91.3	89.5	1.04	0.38	0.49	55.3	54.6
February	7.11	0.30	0.83	95.5	87.2	0.34	0.10	0.16	64.3	59.5
March	7.72	0.39	0.73	94.8	90.4	0.39	0.17	0.16	54.8	59.5
April	7.26	0.48	0.60	93.2	90.9	0.52	0.22	0.20	55.4	59.1
May	6.95	0.69	1.04	89.9	84.7	0.50	0.24	0.22	52.3	56.1
June	5.95	0.58	2.13	90.3	64.8	0.75	0.39	0.41	48.0	45.4
July	7.00	0.81	1.51	88.7	80.2	0.77	0.38	0.42	58.7	51.5
August	6.70	0.51	0.64	92.5	90.5	0.79	0.25	0.27	67.3	62.7
September	5.60	0.33	0.92	93.9	82.7	0.43	0.08	0.08	79.7	79.3
October	8.15	0.52	1.76	93.6	78.4	0.60	0.14	0.13	75.5	76.4
November	7.82	0.39	1.1	95.0	85.8	0.54	0.08	0.13	83.1	73.9
December	7.40	0.47	2.0	93.6	75.3	0.58	0.13	0.16	75.9	71.2
Average	7.17	0.51	1.18	92.7	83.4	0.60	0.21	0.24	64.2	62.4

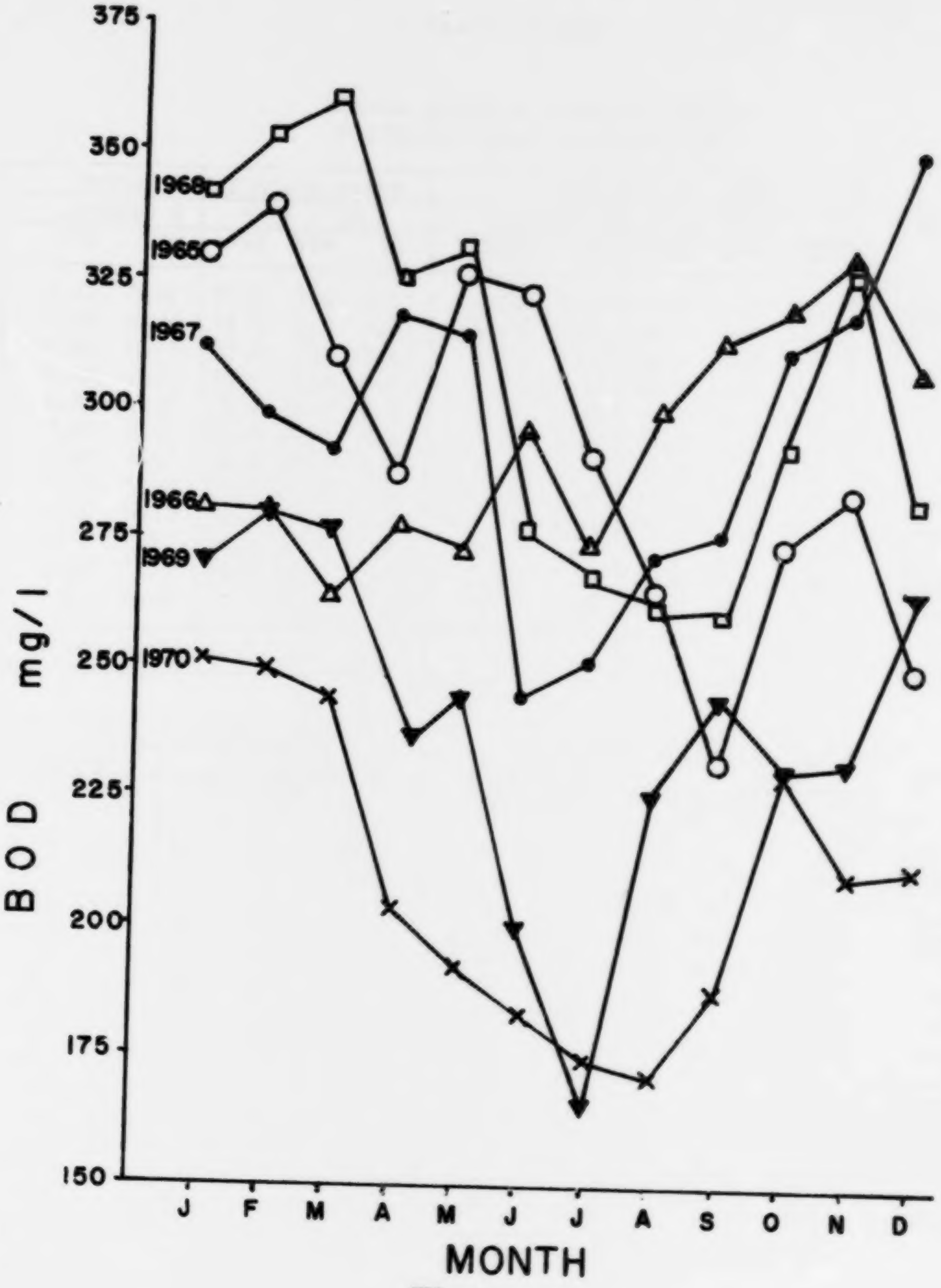

Figure 4
Monthly Sewage BOD Variation

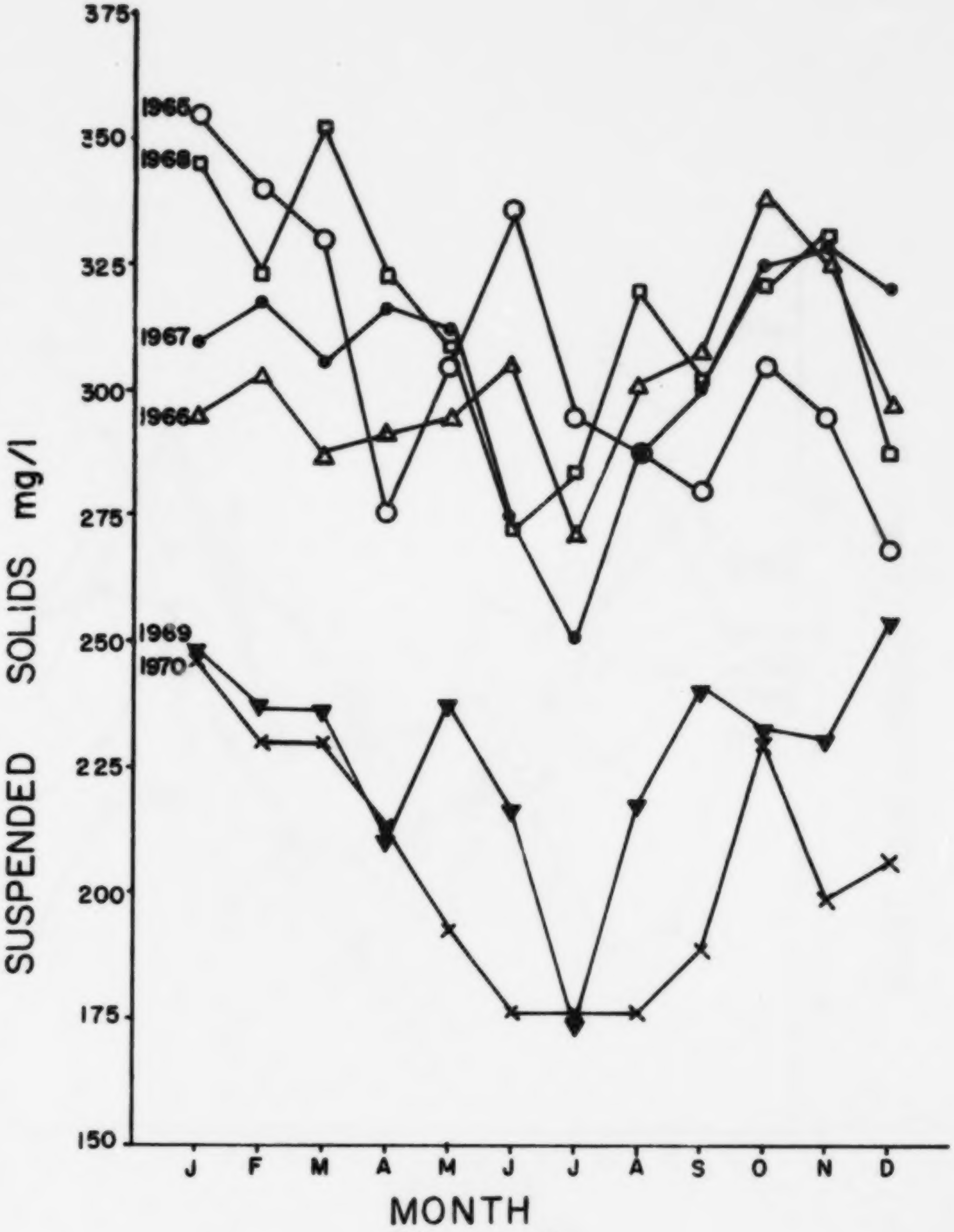

Figure 5

Monthly Sewage Suspended Solids Variation

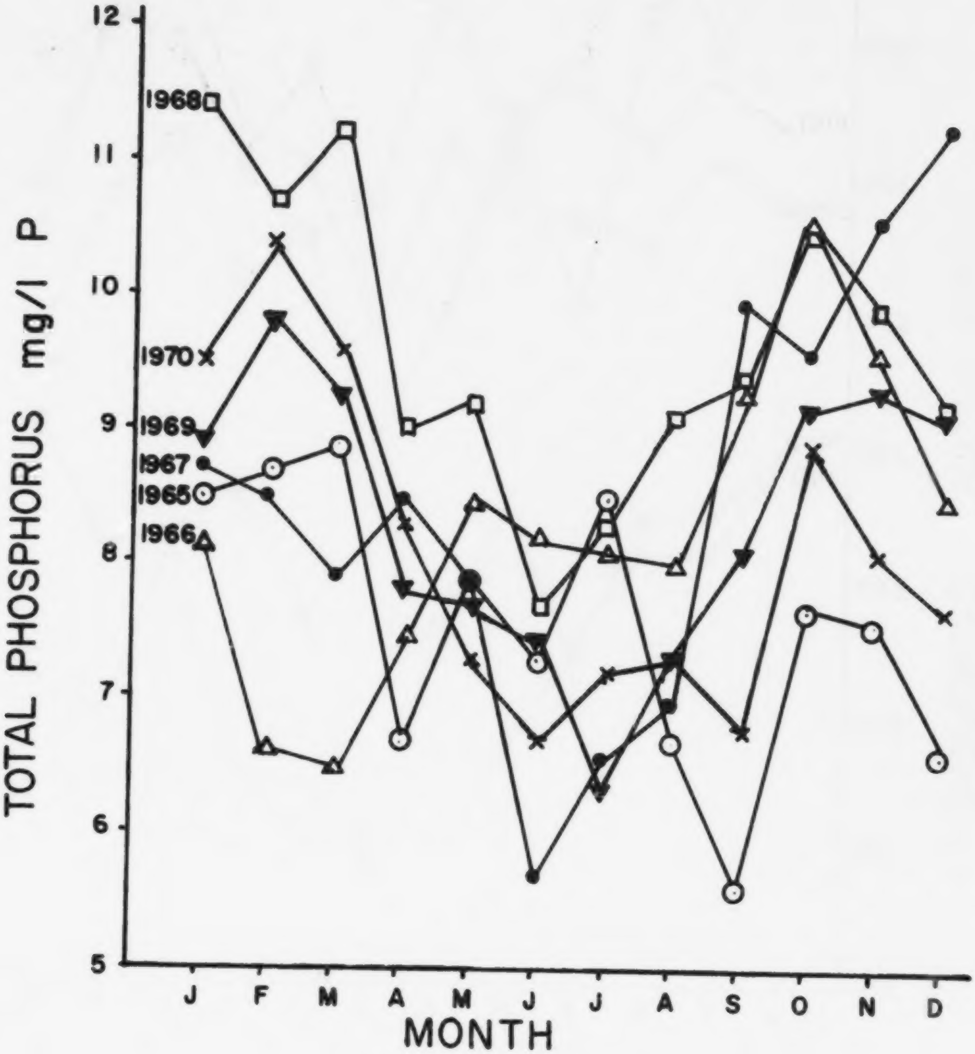

Figure 6

Monthly Sewage Total Phosphorus Variation

The biological activities for 1970 in the West and East Plants will be different from the previous years because of the different loadings, therefore the effluent properties were not compared with the previous years. However, the percent total phosphorus removal in the West Plant was greater in 1970 (83.1%) than in the 1968 (76.2%) and 1969 (76.9%) period.

The effluent results indicate a very low total soluble phosphorus concentration in the East Plant effluent; 0.30 mg/l P as a yearly average in comparison with 1.1 mg/l P in the West Plant. A yearly average for effluent characteristics was from January 12, 1970 (iron addition) to December 31, 1970. The yearly averages for total phosphorus concentrations for the East Plant was 0.70 mg/l P (91.3% removal) and 1.4 mg/l P (83.1% removal) for the West Plant. These total phosphorus concentrations varied greatly at times due to plant operational problems, start up period of iron addition, plant acclimation and seasonal changes. The objective of maintaining a total phosphorus residual of 0.50 mg/l P was obtained on a monthly average only twice, in May and August. The daily data in Appendix H indicates that this objective probably could have been obtained every month after the initial acclimation period except for a mixed liquor suspended solids control problem. During the last four months of the grant period, mixed liquor suspended solids were discharged in the effluent from the final sedimentation basins contributing a significant amount of insoluble phosphorus to the effluent. Considering the 354 days from January 12, 1970 to December 31, 1970 the total phosphorus concentration in the East Plant effluent met the objective on 195 days (55.1% of the time) while the West Plant effluent met the objective on only 60 days (16.9% of the time). During the same time period the total soluble phosphorus concentration in the East Plant effluent was less than or equal to 0.50 mg/l P on 311 days (87.9% of the time) while the West Plant effluent was in that range only 143 days (40.4% of the time). Another comparison of the data was to divide the year into several periods (remember iron was added only to the East Plant) as shown in Table 3. The low total soluble phosphorus concentration in the effluents indicated the success to the iron addition for phosphorus precipitation in the East Plant.

The acclimation period referred to was very difficult to define because of all the biological aspects that were possibly affected. Arbitrarily we assigned January and February as the initial period because of addition problems.

Plant performance indicators such as removal of BOD, COD and suspended solids were compared between the West and East Plant and both plants operated about the same. The slightly lower percent removals in the East Plant reflected the greater loss of mixed liquor suspended solids from the sludge blankets in the East Plant sedimentation basins. The SDI yearly averages of 0.97 for the West

TABLE 3

PHOSPHORUS CONCENTRATION FOR DIFFERENT PERIODS IN 1970

1970 Period	Total Phosphorus					Total Soluble Phosphorus					Iron Addition to East Plant	
	mg/l P			% Removal		mg/l P			% Removal			
	SS	W	E	W	E	SS	W	E	W	E	lb/day	mg/l
Weekday Addition Acclimation Jan 12 - Feb 28	10.1	2.7	0.77	72.7	92.2	3.9	2.3	0.49	40.3	87.4	11004	12.5
Spring Mar 1 - May 31	8.4	1.6	0.62	81.0	92.5	3.4	1.2	0.38	64.3	88.9	12600	13.2
Continuous Addition Summer June 1 - Sept 30	7.0	0.87	0.64	87.6	90.7	2.6	0.54	0.22	79.2	91.6	7527	6.9
Fall - Winter Oct 1 - Dec 31	8.2	1.1	0.81	86.3	90.3	2.9	0.74	0.19	74.2	93.0	7066	6.7
Yearly Average	8.2	1.4	0.70	83.1	91.3	3.1	1.1	0.30	67.5	90.7	9274	9.4

The biological activities for 1970 in the West and East Plants will be different from the previous years because of the different loadings, therefore the effluent properties were not compared with the previous years. However, the percent total phosphorus removal in the West Plant was greater in 1970 (83.1%) than in the 1968 (76.2%) and 1969 (76.9%) period.

The effluent results indicate a very low total soluble phosphorus concentration in the East Plant effluent; 0.30 mg/l P as a yearly average in comparison with 1.1 mg/l P in the West Plant. A yearly average for effluent characteristics was from January 12, 1970 (iron addition) to December 31, 1970. The yearly averages for total phosphorus concentrations for the East Plant was 0.70 mg/l P (91.3% removal) and 1.4 mg/l P (83.1% removal) for the West Plant. These total phosphorus concentrations varied greatly at times due to plant operational problems, start up period of iron addition, plant acclimation and seasonal changes. The objective of maintaining a total phosphorus residual of 0.50 mg/l P was obtained on a monthly average only twice, in May and August. The daily data in Appendix H indicates that this objective probably could have been obtained every month after the initial acclimation period except for a mixed liquor suspended solids control problem. During the last four months of the grant period, mixed liquor suspended solids were discharged in the effluent from the final sedimentation basins contributing a significant amount of insoluble phosphorus to the effluent. Considering the 354 days from January 12, 1970 to December 31, 1970 the total phosphorus concentration in the East Plant effluent met the objective on 195 days (55.1% of the time) while the West Plant effluent met the objective on only 60 days (16.9% of the time). During the same time period the total soluble phosphorus concentration in the East Plant effluent was less than or equal to 0.50 mg/l P on 311 days (87.9% of the time) while the West Plant effluent was in that range only 143 days (40.4% of the time). Another comparison of the data was to divide the year into several periods (remember iron was added only to the East Plant) as shown in Table 3. The low total soluble phosphorus concentration in the effluents indicated the success to the iron addition for phosphorus precipitation in the East Plant.

The acclimation period referred to was very difficult to define because of all the biological aspects that were possibly affected. Arbitrarily we assigned January and February as the initial period because of addition problems.

Plant performance indicators such as removal of BOD, COD and suspended solids were compared between the West and East Plant and both plants operated about the same. The slightly lower percent removals in the East Plant reflected the greater loss of mixed liquor suspended solids from the sludge blankets in the East Plant sedimentation basins. The SDI yearly averages of 0.97 for the West

Plant mixed liquor and 1.04 for the East Plant indicated that the East Plant produced a slightly better settling sludge. (See Table 4).

The daily sewage and effluent results for BOD, phosphorus and iron were separated by the days of the week. Figure 7 shows the daily BOD variation indicating a fairly constant Monday through Friday average BOD. The East Plant effluent BOD was slightly higher than the West Plant due to the greater loss of solids. The Friday results were higher because more solids were lost on that day. No logical explanation was found for the higher East Plant effluent BOD on Monday except that the effluent had higher suspended solids concentration than the West Plant. The Monday mixed liquor SDI was 1.03 and 1.10 respectively for the West and East Plants indicating better overall settling in the East Plant.

Figure 8 shows the daily phosphorus variation. On Monday the screened sewage total phosphorus and total soluble phosphorus was the highest and on Sunday the lowest with the rest of the days fairly constant. The effluent data shows the greater removal in the East Plant. Figure 9 shows the monthly phosphorus variation and indicates the great difference in the effluent values early in the year. This figure clearly shows the variation between the West and East Plant for the total and total soluble phosphorus concentrations and the objective total phosphorus concentration of 0.50 mg/l P. The East Plant Monday data includes the period when iron was not added over the week end resulting in a higher effluent total soluble phosphorus concentration.

Figure 10 shows the daily iron variations (the data does not include the January and February results because of problems in the analyses). The sewage total iron concentration was lowest on Sunday and increased to a peak on Friday and then dropped slightly on Saturday. The East Plant effluent total iron content was about double that of the West Plant. Some of this increase was caused by the greater loss of solids especially on Fridays. The soluble iron concentration in the effluents were very low averaging 0.21 mg/l Fe in the West Plant and 0.24 mg/l in the East Plant. The total iron concentration was greater in the East Plant effluent because of the higher iron concentration in the suspended solids.

B. Mixed Liquor and Return Sludge Characteristics

The addition of iron increased the ash content of the East Plant sludge. To compensate for this ash an attempt was initiated in July, at the suggestion of project officer Dr. R. Bunch, to keep the East Plant mixed liquor suspended solids 200 mg/l higher than the West Plant which would equalize the biomass or volatile suspended solids in both plants. The monthly average mixed liquor suspended solids values indicate that 200 mg/l differential was successfully maintained.

TABLE 4

MONTHLY AVERAGE MIXED LIQUOR AND RETURN SLUDGE CHARACTERISTICS

Month	Iron Addition To East Plant		MIXED LIQUOR						
			E.P.	pH		Susp.Solids mg/l		S. D. I.	
	Lbs/day	mg/l	M.G.D.	WP	EP	WP	EP	WP	EP
January	11,778	12.8	103.4	7.1	7.1	2686	2693	0.94	1.02
February	10,423	12.2	98.4	7.0	7.0	2723	2805	1.11	1.11
March	12,192	13.7	100.2	7.1	7.0	2537	2580	1.16	1.16
April	12,960	13.7	109.0	7.1	7.0	2741	2665	1.09	0.94
May	12,630	12.3	119.8	7.0	7.0	2991	2974	1.03	0.90
June	8,081	7.2	132.8	7.2	7.1	2541	2604	0.82	0.84
July	7,392	6.7	130.4	7.1	6.9	2614	2617	0.86	1.11
August	7,210	6.9	123.7	7.0	6.9	2329	2589	1.06	1.22
September	7,427	6.8	133.0	7.2	7.0	2207	2426	0.99	1.19
October	6,408	6.2	123.8	7.1	7.0	2588	2773	0.86	0.98
November	6,780	6.3	126.9	7.1	7.0	2794	2976	0.92	1.14
December	8,001	7.4	127.6	7.1	7.0	2524	2747	0.83	0.90
Average	9,274	9.4	119.1	7.1	7.0	2606	2704	0.97	1.04

Month	RETURN SLUDGE - CENTRIFUGED SOLIDS - DRY BASIS							
	% Total - P		% Total - N		% Total-FE		% Total Ash	
	WP	EP	WP	EP	WP	EP	WP	EP
January	2.36	2.76	6.67	6.34	2.05	5.67	24.54	30.57
February	2.37	2.65	6.53	6.14	2.00	5.15	25.31	29.74
March	2.31	2.62	6.42	6.06	1.99	5.52	26.44	31.58
April	2.18	2.47	6.62	6.21	1.67	5.55	26.18	31.78
May	2.14	2.44	6.52	6.05	1.84	5.34	27.88	32.83
June	2.18	2.49	6.62	6.16	1.74	4.84	27.20	31.83
July	2.40	2.87	6.64	6.00	1.84	4.76	27.72	32.82
August	2.42	2.70	6.63	6.12	1.94	5.08	26.87	31.58
September	2.31	2.58	6.61	6.01	1.84	5.11	26.66	31.76
October	2.33	2.69	6.76	6.30	1.81	4.45	25.13	29.60
November	2.32	2.61	6.83	6.30	1.90	4.73	24.78	29.36
December	2.11	2.42	6.90	6.46	1.72	4.80	23.20	27.97
Average	2.29	2.61	6.65	6.18	1.86	5.08	25.99	30.95

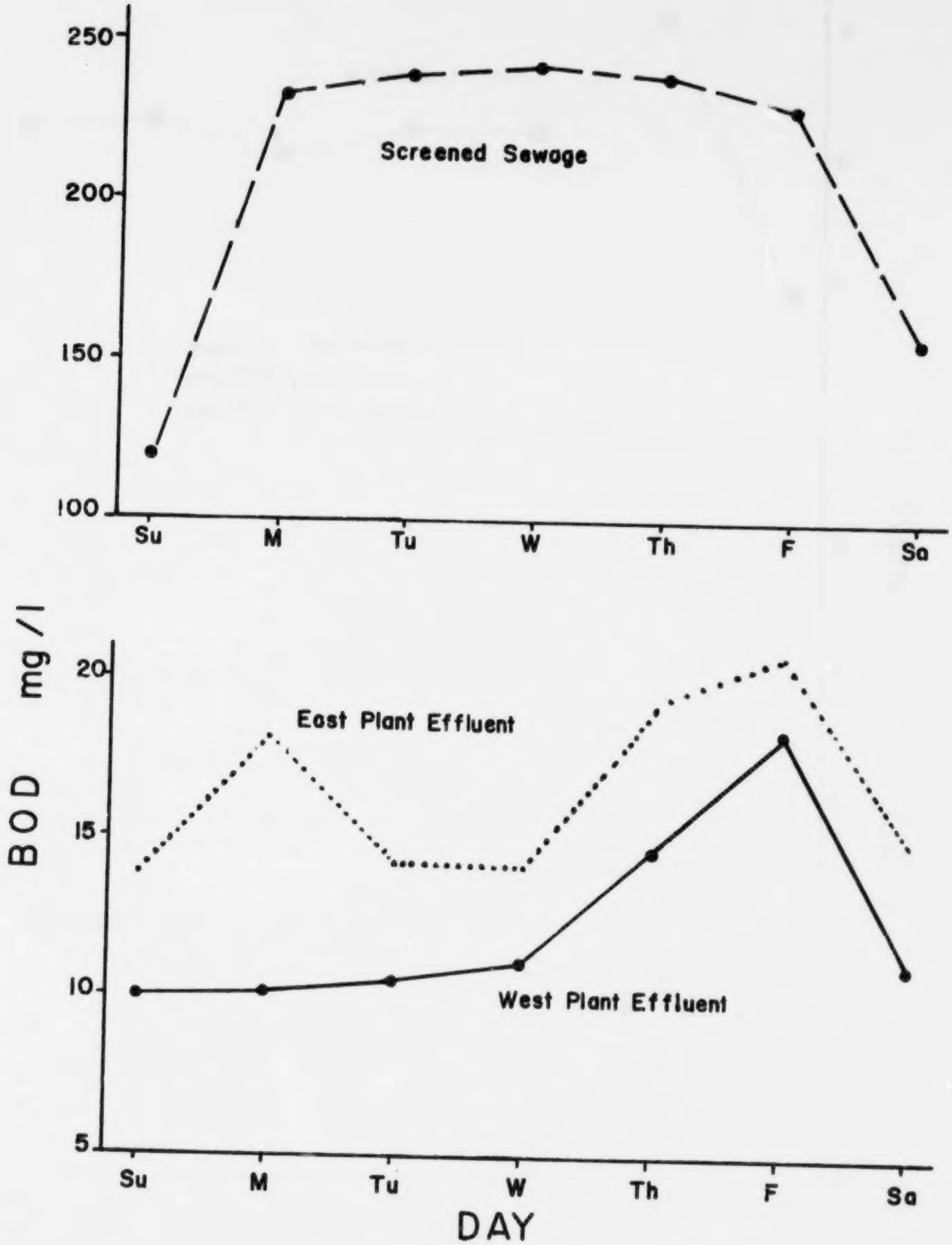

Figure 7

Daily BOD Variation

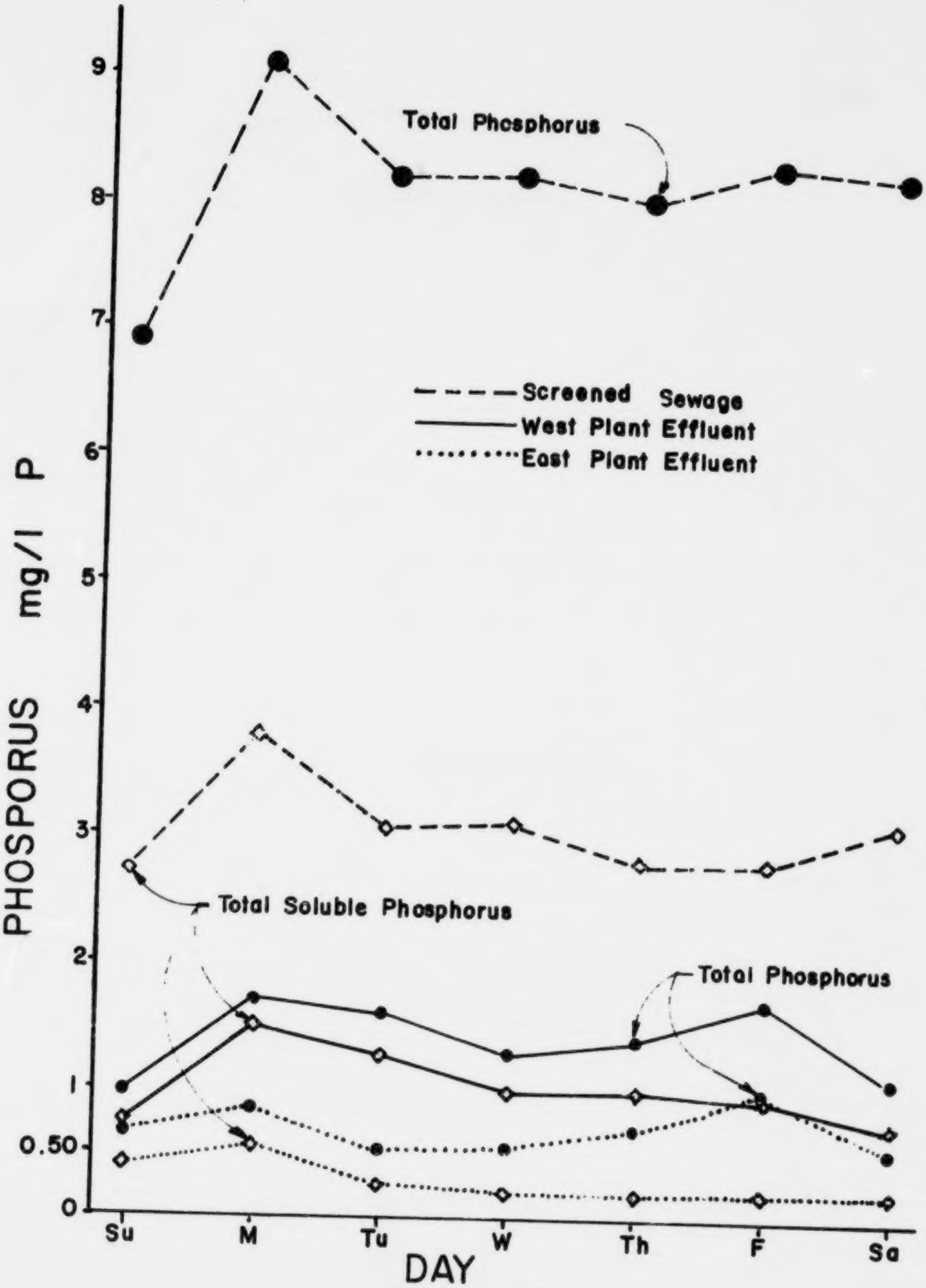

Figure 8
Daily Phosphorus Variation

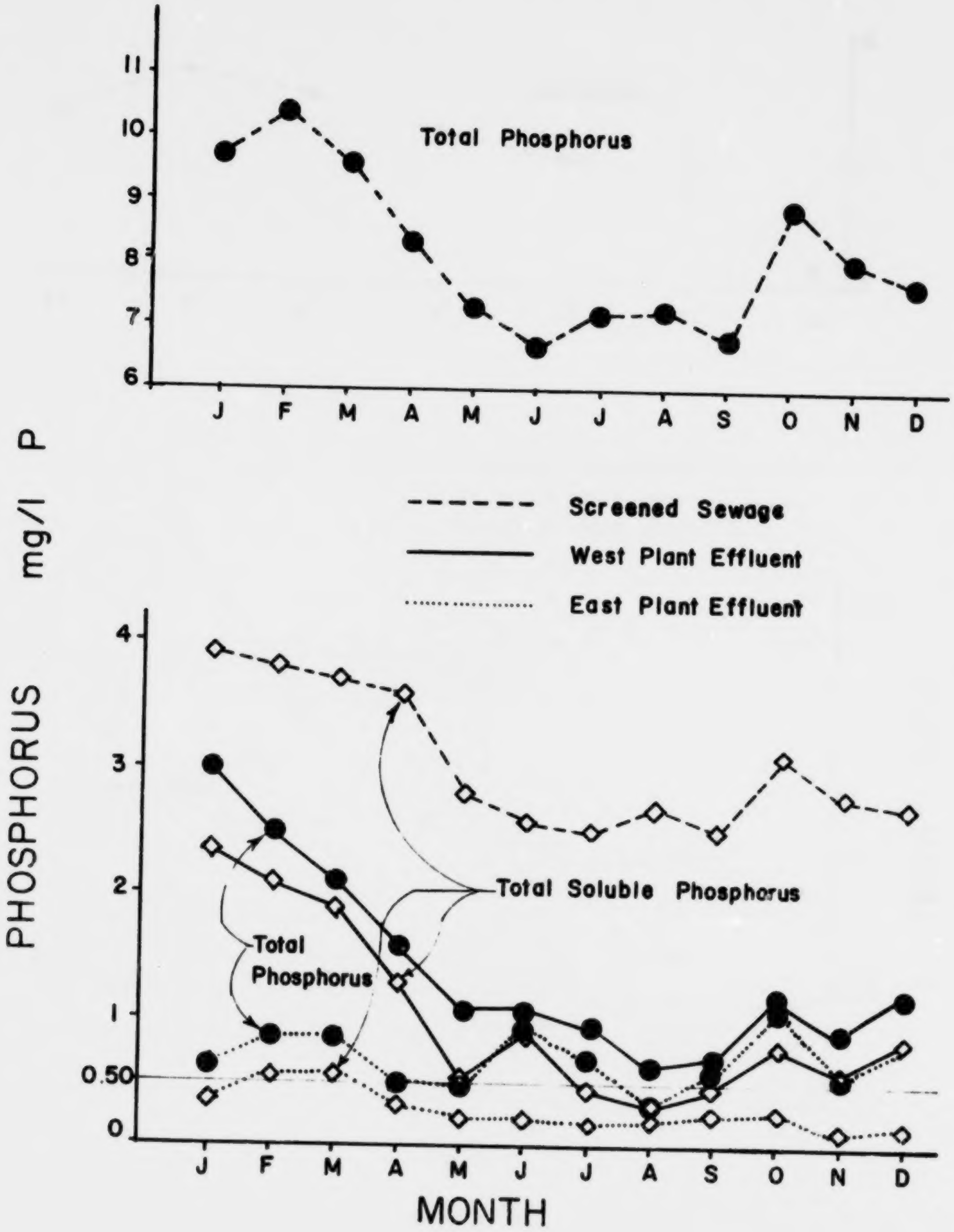

Figure 9
1970 Phosphorus Variation

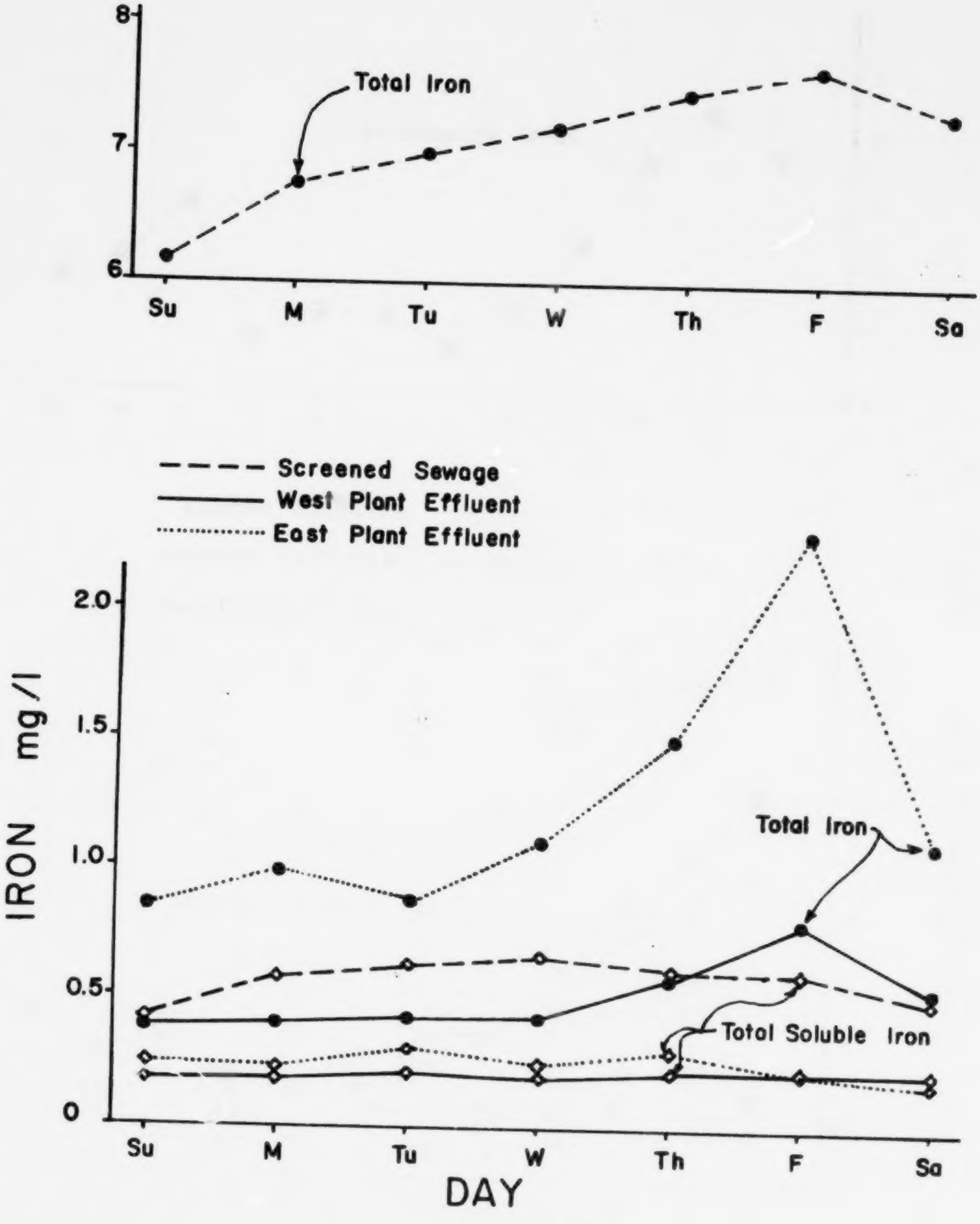

Figure 10

Daily Iron Variation

During the initial stages of the pickle liquor addition, Dr. Bunch raised the question as to what inhibitors were in the pickle liquor and if they had any carcinogenic effects. The companies supplying the inhibitors to the A. O. Smith Corporation were contacted and requested to supply us with information about their product. One company said their product was a biodegradable surface active agent and the other company said that they did not know anything about the carcinogenity of their chemical but expected no problems because of the tremendous dilution factor involved.

The solids production in the mixed liquor was reviewed. A solids production difference between the West and East Plants could not be determined because the volume of sludge wasted from each plant individually was not accurately measured. The total sludge produced in both plants was obtained by adding the tons of dried solids removed and the solids present in the effluent. It should be remembered that the Jones Island Plant does not have conventional primary settling, only fine screening, and therefore the sewage BOD and suspended solids feed to the biological process was high. This higher load will result in a greater overall production of solids. Figure 11, shows the solids produced in conjunction with the BOD removed and shows the monthly variation of solids produced per 1000 pounds of BOD removed. The increase in production of solids per BOD removed increased during periods of low BOD content of the sewage because the dewatering facilities were operated to remove as many solids as practical resulting in a lower sludge age.

Figure 12 shows the solids production per pound of BOD removed for the last six years. Relating this data to Figure 4 (sewage BOD variation) a greater production per pound of BOD removed occurs during periods of lower sewage BOD. During the lower BOD period the solids were removed fast enough to produce a lower sludge age and greater production. In 1965, 1966, 1967 and 1968 solids were not removed fast enough and the sludge age was greater resulting in endogenous respiration but possibly a more stable sludge. This greater solids production and removal may be the reason for the increase noted in the ability of the West Plant to remove phosphorus. The greater the solids production, the greater the amount of phosphorus removed.

The increased phosphorus removal efficiency of the East Plant was confirmed by the increased phosphorus content of the return sludge.

MONTHLY AVERAGES		JAN. 12 - DEC. 31
West Plant R.S.	-	2.29% as P
East Plant R.S.	-	2.61% as P

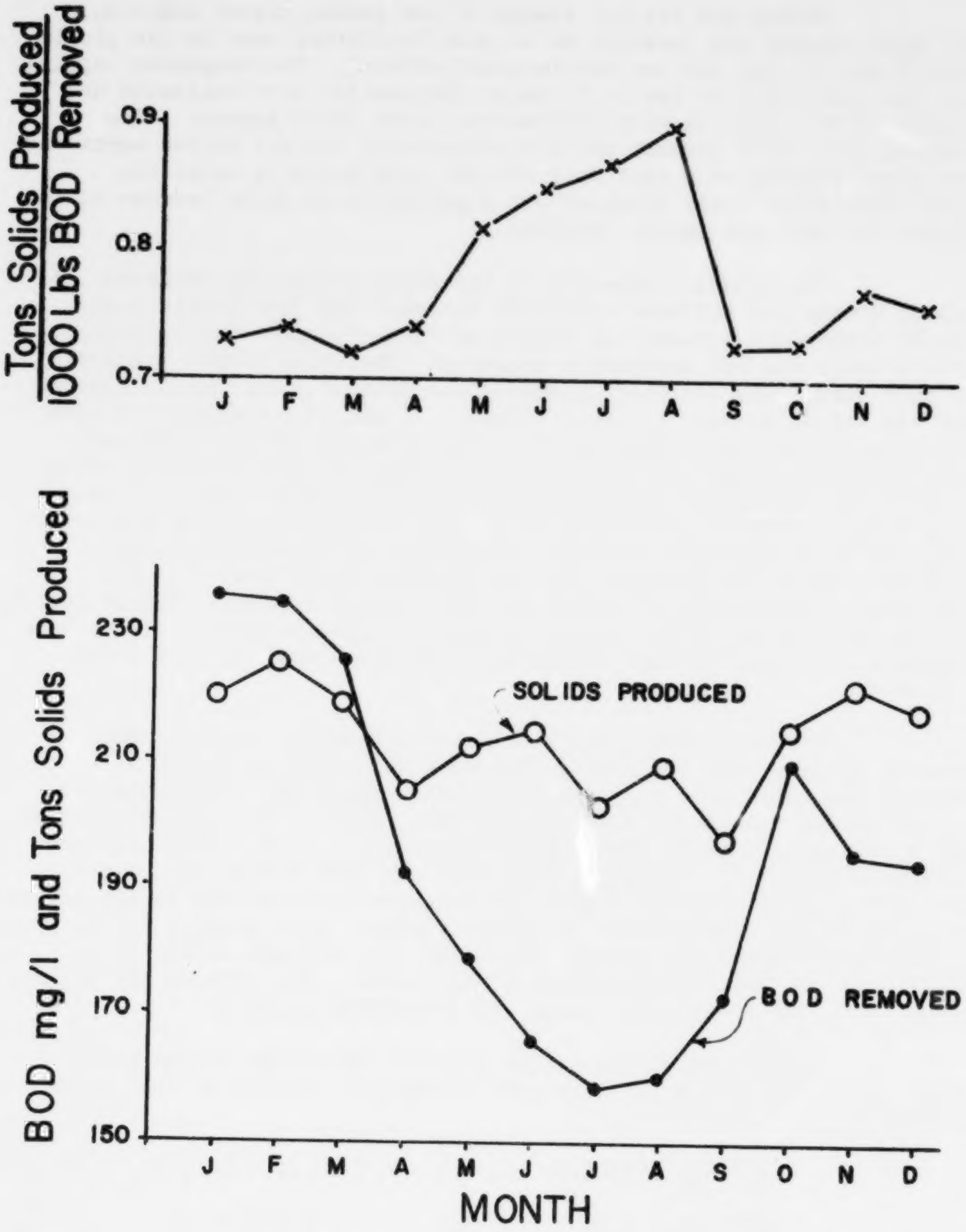

Figure 11

1970 Solids Production per BOD Removed

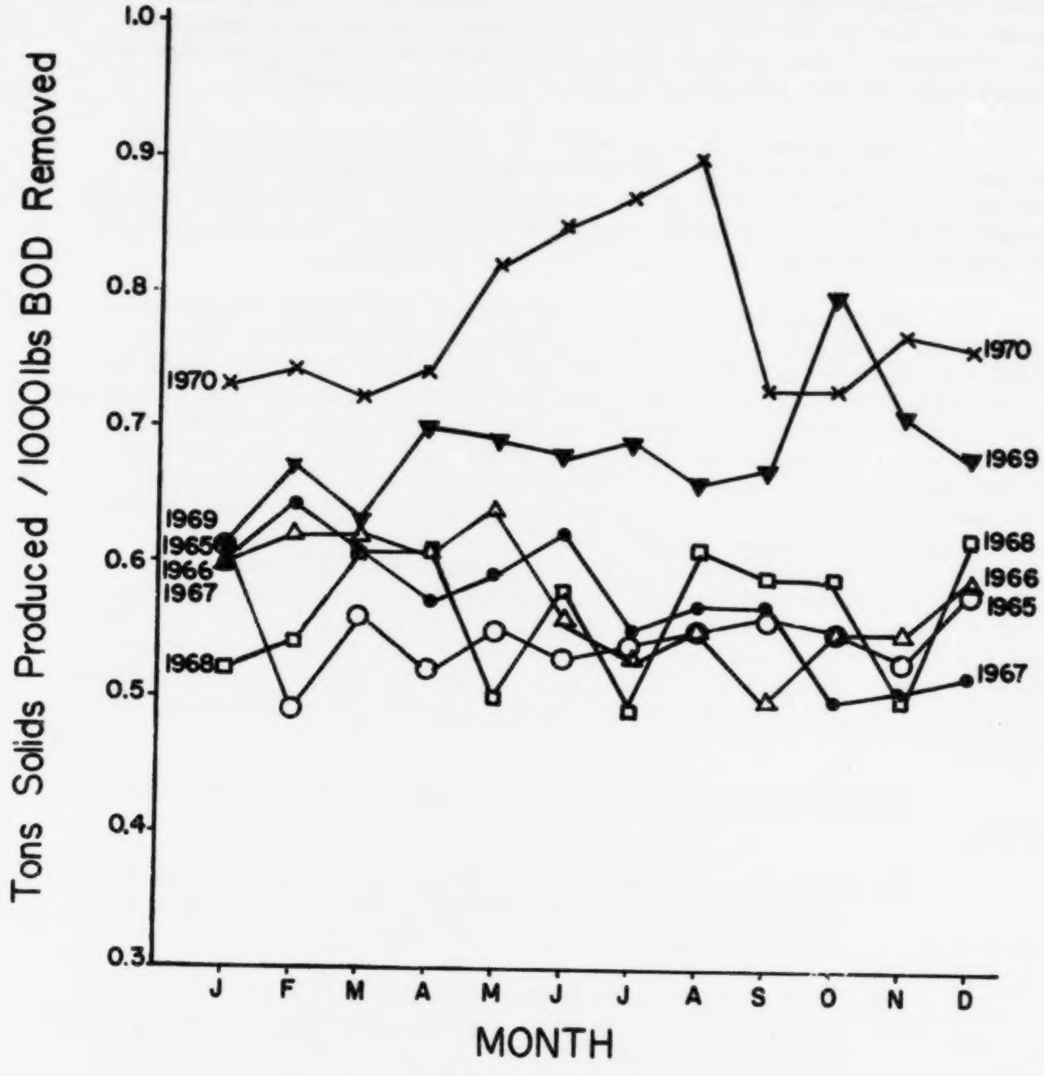

Figure 12

Solids Production per BOD Removed

Along with the phosphorus differences, the pickle liquor addition clearly indreased the iron content of the East Plant return sludge

MONTHLY AVERAGES		JAN. 12 - DEC. 31
West Plant	-	1.86% as Fe
East Plant	-	5.08% as Fe

The monthly average mixed liquor and return sludge properties are shown in Table 4 and the entire data in Appendix H. The greater amount of ash in the East Plant sludge reflects the iron addition. The nitrogen in the sludges from both plants on a yearly average are almost exactly the same when based on an ash free sample.

From January 12 - December 31, 1970 a total of 4,177,394 gallons of waste pickle liquor were added averaging 13,060 gallon per day or 9,274 lbs per day to the East Plant. The specific gravity ranged from 1.090 (0.20 pounds of iron per gallon) to 1.333 (1.04 lbs of iron/gal.) averaging 1.235 (0.71 lb of iron/gallon).

The phosphorus and iron content of the return sludge increased as expected and the question was raised as to the form in which the phosphorus had precipitated. The grant included funds for x-ray diffraction tests to be conducted at Marquette University through the Civil Engineering offices of Dr. Raymond J. Kipp, Chairman, and Dr. Sudershan K. Malhotra, Assistant Professor. The work was done by Dr. Martin A. Seitz and Mr. Robert Riedner (15) of the Marquette College of Engineering. The objective of the x-ray diffraction was to determine the nature of any crystalline inorganic or organic matter in the sludge residue. Return sludge from the West and East Plants was obtained and dried. The dried material was then magnetically separated for x-ray diffraction of the magnetic portion. The details of the procedure are in Appendix I. The inorganic crystalline compound, Vivianite: $Fe_3(PO_4)_2 \cdot 8\ H_2O$ and variations of ferrous phosphate $(Fe_3(PO_4)_2 \cdot (8-x)\ H_2O)$ were found in the sludge from both plants.

Some of the conclusions to the work by Seitz and Riedner (15) were:

"1. In order to identify the compound species in the sludge residue, they must be concentrated and separated from the bulk material.

2. Vivianite in a defective form, $Fe_3(PO_4)_2 \cdot (8-x)\ H_2O$, is present in the sludge residue in varying amounts, of the order of 1%.

3. Freeze drying methods lead to better results upon x-ray analysis, while air drying methods lead to better weight analysis results. Further work, mainly in the area of electrostatic charge pick-up by powder particles, is required in order to obtain a more reliable weight analysis."

The relative concentrations of the ferrous phosphate forms were not determined but of the dried solids samples obtained, one West Plant sample had the greatest percent of magnetic material. This may have resulted from the drying method used (Freeze dried). Much more work is necessary before any conclusions can be drawn.

C. Miscellaneous Tests

During the course of the grant period additional tests were conducted to further investigate the characteristics of the pickle liquor and the associated effect on the properties of the mixed liquor and effluents. These tests included pickle liquor free acid determination; alkalinities on sewage mixed liquor and effluents; soluble sulfates on sewage and effluents; phosphorus uptake rates of the mixed liquor; and phosphorus release in the sedimentation basins.

1. Pickle Liquor Free Acid

The free acid in the pickle liquor from the A. O. Smith Corporation varied from 2.1 to 5.8% H_2SO_4 in the samples collected. The addition of this acid to the East Plant mixed liquor had only a slight effect on the pH with the yearly average West Plant mixed liquor being pH 7.1 and that for the East Plant being pH 7.0. The sulfuric-hydrochloric and pickle liquor from the U. S. Steel Corporation was stronger in free acid and the free acid ranged from 6.6% to 9.3% H_2SO_4. The individual results are listed in Appendix J.

2. Alkalinities on Sewage, Effluents and Mixed Liquors

Periodically, starting in June, samples of screened sewage, effluents and mixed liquors were collected for an alkalinity determination. This was done to determine the effect of the pickle liquor acid on the alkalinity of the system. The yearly sewage alkalinity averaged 224 mg/l as $CaCO_3$ with the effluents averaging 213 in the West Plant and 169 in the East Plant (20.7% difference in the effluents). The alkalinities for the mixed liquors averaged 197 for the West Plant and 187 for the East Plant. The entire data is listed in Appendix K. The differences caused no problems in plant operation.

3. Soluble Sulfates on Sewage and Effluents

Since ferrous sulfate was being added to the East Plant, samples of screened sewage and effluents were collected to determine the differences in the sulfate concentrations. During the early part of the year a few daily samples were analyzed for soluble sulfate and started again in August. Initially some problems were experienced with the analyses but by the end of August all the problems were solved and weekly composites were collected and analyzed. This data from August 23, 1970 through January 2, 1971 should be very representative of what the actual soluble sulfate concentrations will be. An average of the weekly composite data shows a sewage soluble sulfate concentration of 120 mg/l SO_4 with the effluents having 123 and 145 mg/l SO_4 respectively for the West and East Plants. The East Plant effluent had a 17.9% higher sulfate concentration but the increase was not substantial enough to cause concern. As a comparison of relative sulfate concentrations, the 1962 U. S. Public Health Service drinking water standard is 250 mg/l SO_4 (16). The entire data is in Appendix L.

4. Phosphorus Uptake

To further understand the effects of the pickle liquor iron addition, a few simple phosphorus uptake and release studies were conducted. This iron addition, as one would expect, should change the rate of phosphorus uptake in the mixed liquor through the aeration period along with reducing the amount of phosphorus released after the mixed liquor is directed into the sedimentation basin. An initial investigation was conducted to determine if there were any sample handling problems. Samples of East Plant sewage, return sludge and mixed liquor were collected and allowed to stand for one or two hours. An aliquot was taken after various periods to determine how fast the concentration of the soluble ortho-phosphate (SOP) would change. The data shown in detail in Appendix M indicates a small change in concentration of the SOP in sewage, but the concentration changes in the return sludge and mixed liquor were significant. Therefore, sample preparation (filtration) was undertaken immediately after collection.

The SOP uptake rate (biological and/or chemical) was determined by collecting samples from the West and East Plants at various stages during the aeration period. Only one complete test run was conducted but the results do clearly indicate a difference between the two plants. The data in Table 5 indicates a much faster SOP uptake in the East Plant as expected because of the iron ladened sludge and the iron addition.

TABLE 5

SOLUBLE ORTHO - PHOSPHATE UPTAKE

SOP in mg/l P

PLANT	SEWAGE	RETURN SLUDGE	MIXED LIQUOR IN FEED CHANNEL	AERATION TANK MIXED LIQUOR INLET	TURNING POINT	OUTLET
East	1.5	1.4	1.9*	0.66	0.38	0.39
West	1.5	0.97	2.8	2.8	0.38	0.31

*Just prior to the addition of the pickle liquor

5. Phosphorus Release

The release of SOP from the mixed liquor suspended solids can be a considerable amount as indicated by the bench scale studies of R. M. Manthe (17). It is difficult to compare bench studies with actual conditions in a waste water treatment plant but for purposes of comparison this type of an experiment can be useful. The difference in the SOP release between the West and East Plant mixed liquor solids was determined by obtaining samples of mixed liquor from the aeration tank outlet and allowing them to settle for 0, 1/2, 1, 2, 3 and 4 hours. The original mixed liquor sample was separated into five - liter graduated cylinders for settling. After each designated time period the cylinder was divided into five aliquots each representing 200 ml. Each aliquot was filtered as soon as possible and analyzed for SOP. The pH of each sample was also determined. Three tests were conducted in this fashion except the first test was conducted in the laboratory and the second and third tests were set up at the site of sample collection. The data clearly indicates the reason for an on site test. The time delay between the sample collection and delivery to the laboratory was too great and as shown in Figure 13 the West Plant mixed liquor had already released a considerable amount of SOP.

The comparison bench SOP release tests in Figures 13, 14 and 15 indicate that the iron added to precipitate the phosphorus also decreases the release of SOP. Phosphorus release can hinder the over-all phosphorus removal because a good phosphorus uptake could be obtained in the aeration stage of treatment and lost in the sedimentation basin. The varying soluble iron concentration was investigated along with SOP release during one of the test runs. Figure 16 indicates that a release of iron occurs in both plants, especially in the sludge blankets. The pH values of the supernatant remained relatively constant while the pH of the sludge from both plants decreased markedly which would tend to solubilize more iron. In spite of the pH change and soluble iron release in the

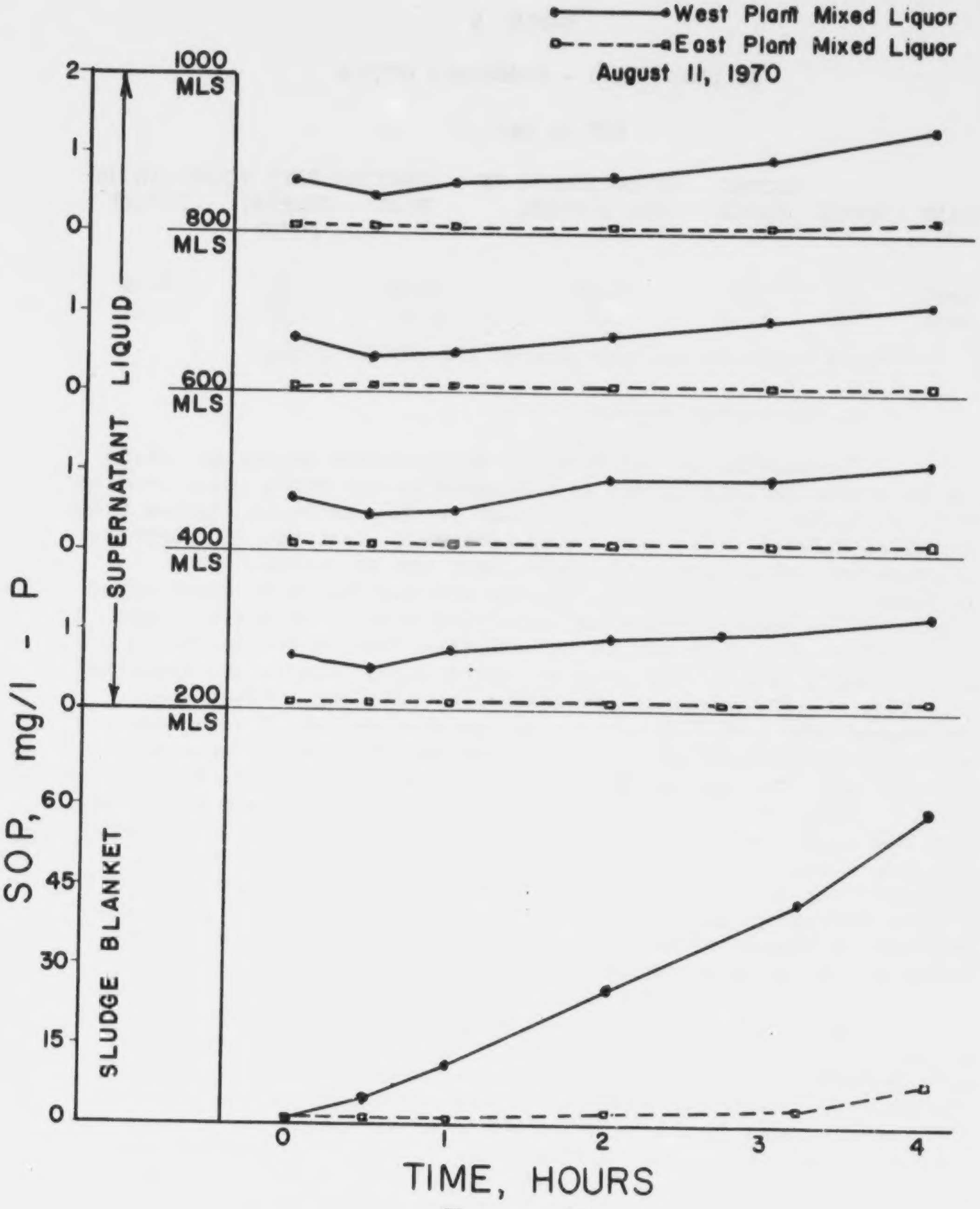

Figure 13

SOP Release From Mixed Liquor

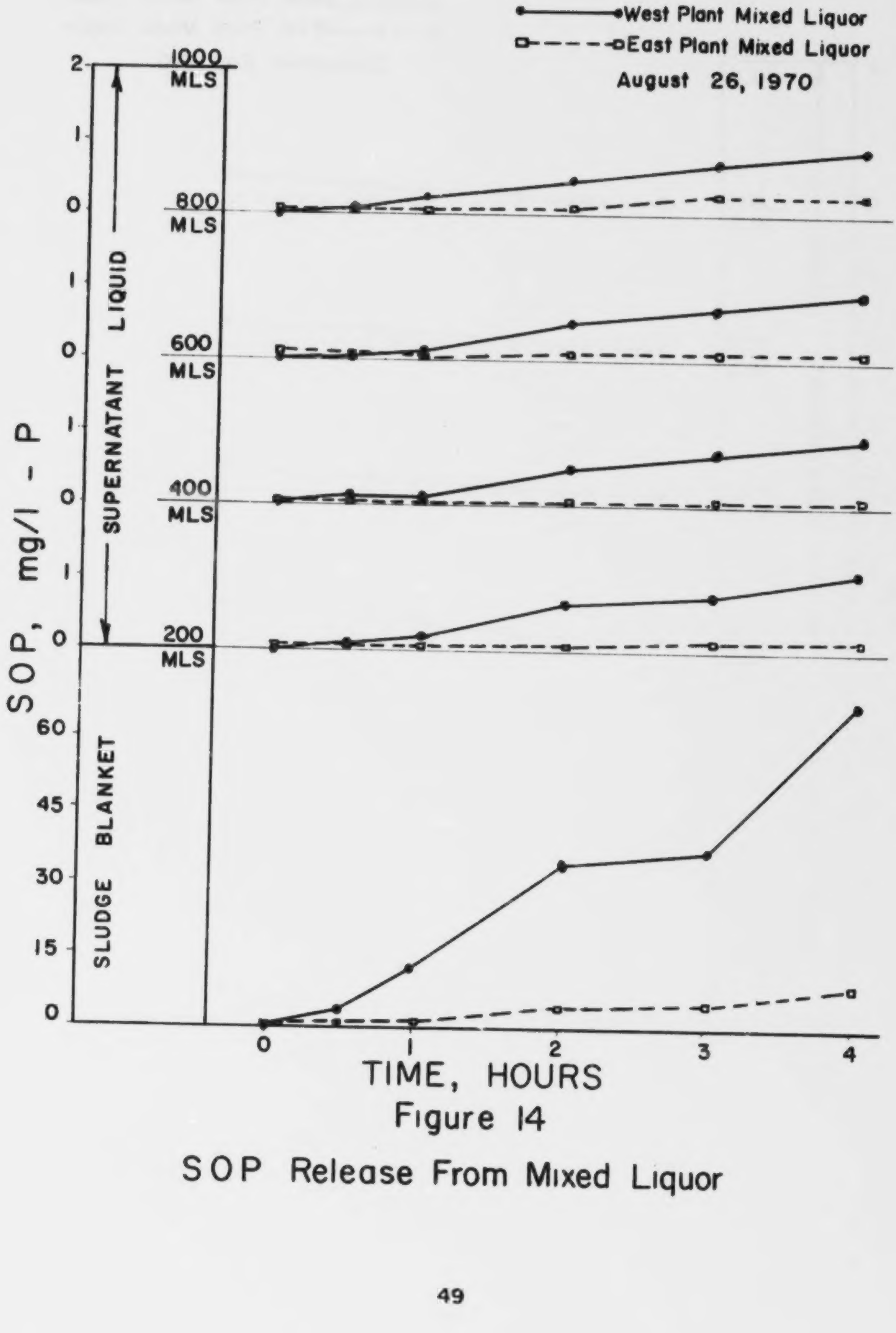

Figure 14

SOP Release From Mixed Liquor

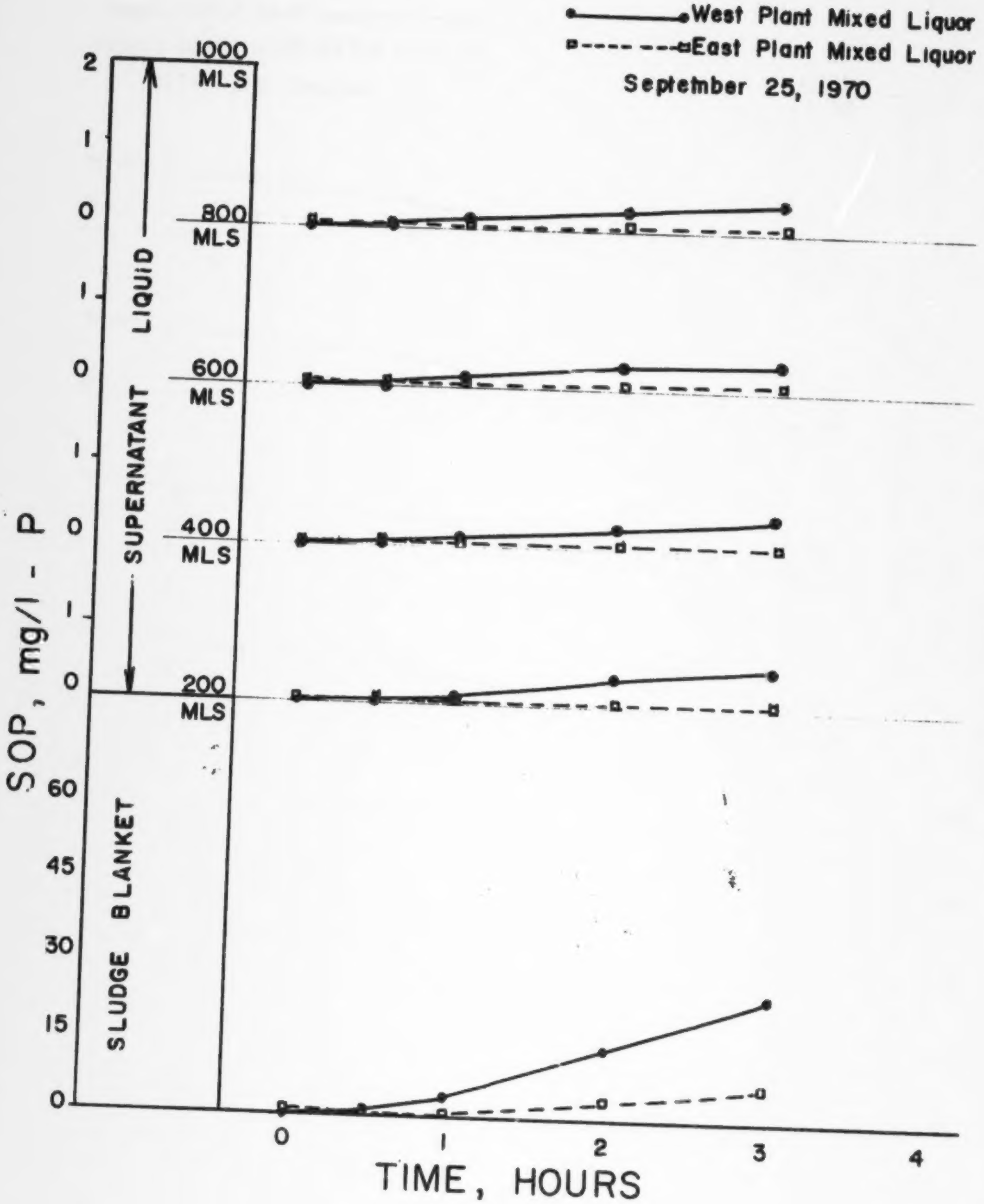

Figure 15

SOP Release From Mixed Liquor

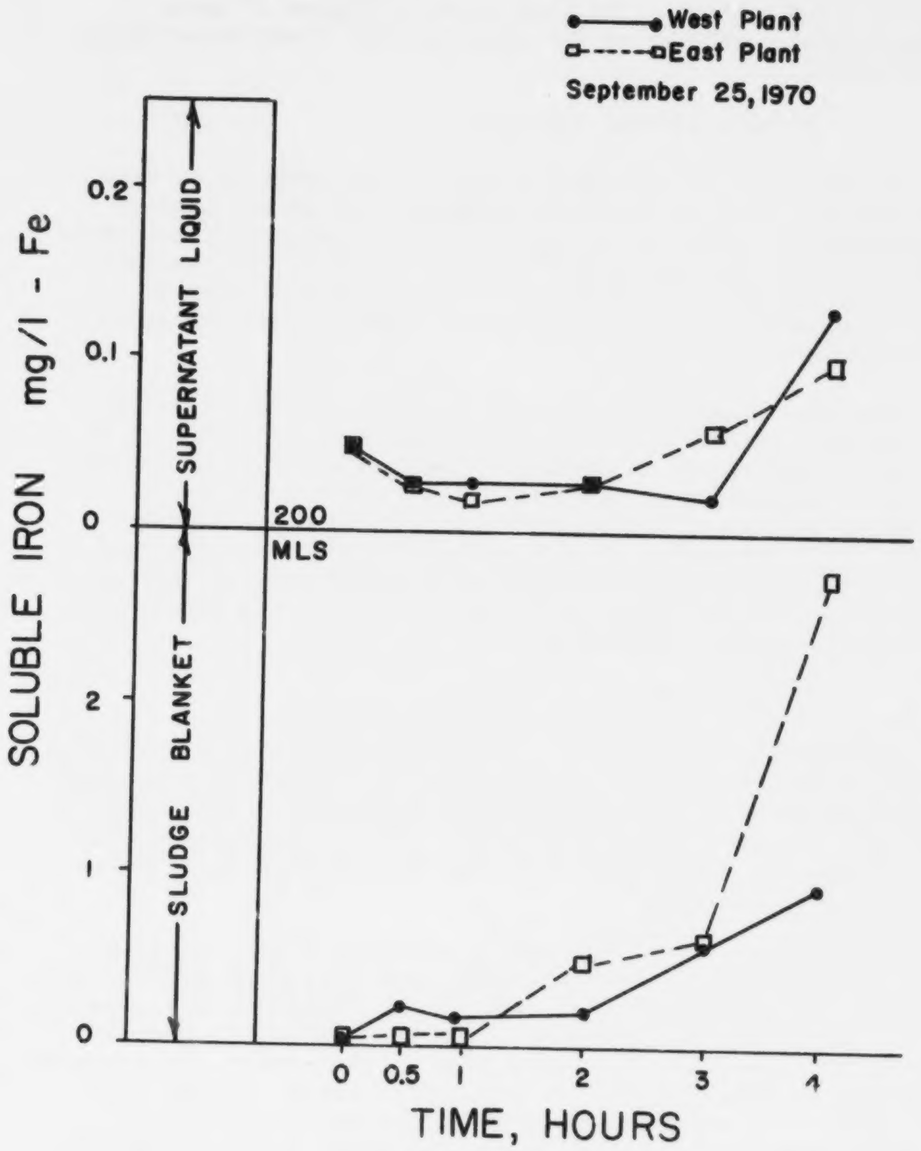

Figure 16

Soluble Iron Release From Mixed Liquor

East Plant sludge, very little SOP was released in comparison with the West Plant.

Two additional tests were conducted to study SOP release but these involved measuring only the supernatant SOP after settling for 0, 1/2, 1 and 2 hours. The data shown in Figure 17 again indicates a greater release of SOP from the West Plant mixed liquor suspended solids.

D. Rate of Iron Addition

At the start of the grant period it was proposed to vary the iron addition rate to determine minimum, maximum and optimum iron requirements. This is the reason why the complicated automatic iron addition controls were ordered. Unfortunately this equipment was not operating until the middle of December 1970 because of delays in equipment delivery and the time remaining was too short for any experimentation.

The iron added throughout the year was varied producing monthly averages of 13.7 mg/l Fe in March and April to 6.2 mg/l Fe added to the mixed liquor in October. The dosing was rough because it was not in proportion to the mixed liquor flow, sometimes in proportion to the expected phosphorus concentration and sometimes in proportion to the supply of pickle liquor available. The data in Table 4 indicates the average monthly concentration of iron added to the East Plant mixed liquor but no optimum iron requirement can be determined from the information available.

E. Mixed Liquor Biota

Microscopic examinations of the mixed liquor from both the West and East Plants were conducted five days per week for the first part of the grant period and was reduced to biweekly examinations in September for the remainder of the grant. These examinations determined the types and numbers of organisms and the general condition of the mixed liquor.

At the start of the project in January, a very active and profuse number of organisms were noted in the East Plant mixed liquor with normal concentrations in the West Plant. The numbers decreased after a change in the sewage distribution from 42% to the West and 58% to the East Plant to 50% to each plant. In February the organisms continued to decrease in the East Plant after six of the twenty aeration tanks were taken out of service. No general change was noted in the West Plant. During March, low mixed liquor suspended solids were maintained in both the West and East Plants and a further decrease in biota numbers was observed. This light biota concentration continued until the middle of May when an increase was observed

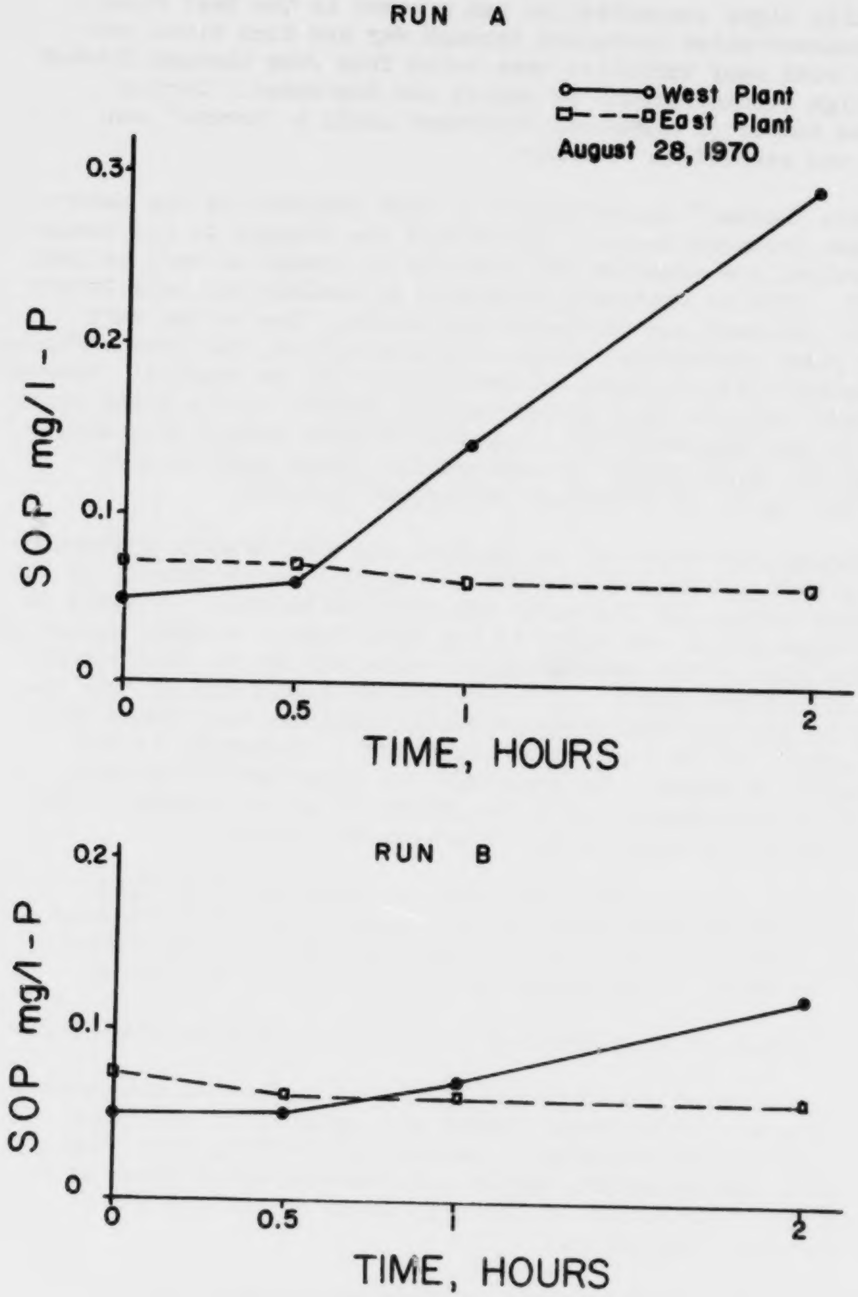

Figure 17

SOP Release From Mixed Liquor

(an especially light concentration was present in the East Plant). The biota concentration increased through May and high biota concentrations with many varieties were noted from June through October with very high concentrations in August and September. During November the number of organisms decreased until a "normal" concentration was reached in December.

This "normal" concentration is that compared to the observations of the previous years. Considering the changes in the sewage characteristics, the organism may continue to change or vary as they did in 1970. This is extremely difficult to analyze and only future microscopic analyses can determine any trends. Due to the many changes in plant operations, sewage characteristics, the iron addition, and the limited data, no detailed conclusions can be reached. However, the data does indicate that no deleterious effects on the biota could be traced to the iron addition. Appendix N shows sample microscopic analyses of the mixed liquor on arbitrarily chosen days to show generally the ranges of organisms throughout the year.

During the course of the project one very drastic difference between the West and East Plants was the algae growths present in the sedimentation basins (on the walls and overflow weirs). In April an excessive algae growth was noted in the East Plant. A small amount of algae always grew in the sedimentation basin but not to this extent. This excessive algae growth continued through August and in June the growth was so profuse that numerous basin cleanings were necessary. The algae growth in the West Plant was normal, increasing in May and decreasing in August. In September the algae had essentially disappeared in both plants, with the coming of colder weather. The algae had completely disappeared by the end of October.

Samples of the algae from both the West and East Plant sedimentation basins were collected for microscopic identification. The following Table 6 lists the various types of algae identified along with the range of concentration in the samples collected.

F. Effect of Iron Addition on the Plant Physical Facilities

Every year at the Sewerage Commission a routine maintenance program is scheduled for normal repair and cleaning of equipment. This schedule includes draining, cleaning and checking East Plant aeration tanks, sedimentation basins and channels which gives us an ideal situation to determine if the iron addition has any effect on the plant physical facilities.

In addition to the normal routine maintenance, special consideration was given to the East Plant mixing channel where the return sludge is added to the raw screened sewage, followed by the iron addition. The mixing channel has five sets of swing diffusers with ceramic tubes. In February 1970 two sets of the diffusers were

TABLE 6

MICROSCOPIC IDENTIFICATION OF SEDIMENTATION BASIN ALGAE

	WEST PLANT	EAST PLANT
Green Algae Filaments		
ULOTHRIX	Negligible to 50%	30 to 60%
RHIZOCLONIUM	0 to possible 10%	0 to 10%
MOUGEOTIA	0 to < 5%	0 to < 5%
MICROSPORA	0 to 20%	0 to 40%
PITHOPHORA	0 to 10%	0
CLADOPHORA	0 to possible 10%	0
STIGECLONIUM FILAMENTS	0 to > 90%	0 to <5%
MICROTHAMNION	0	0 to <2%
CYLINDROCAPSA	0 to low number	0
SCENEDESMUS	0 to negligible	0
Blue Green Algae		
OSCILLATORIA	Low to 10%	0 to >20%
DIATOMS		
PINNATE	Negligible to very high count	Medium to high count
CENTRIC	Low to high count	Negligible to medium count

replaced with new ceramic tubes to determine the effect of the iron on these diffusers. The remaining three sets were washed and inspected. During September 1970 the swing diffusers were raised for inspection showing the tubes covered with a layer of sludge (similar to February), which was easily removed by washing with water. The under layer of sludge did however have a iron red cast. The inspection of the tubes indicated no unusual conditions.

During the warmer months, aeration tanks and sedimentation basins were drained, cleaned and repaired under the routine maintenance program. In May when one of the East Plant aeration tanks was drained a slight iron red coloration deposit was noted on the walls of the tank for the first 200 feet on the inlet side. Two East Plant sedimentation basins were inspected in September. One of the basins had a ring of red iron colored deposit on the lower walls where the sludge blanket was normally in contact with the wall. The other basin had similar markings but not as pronounced. Other than the coloration, no repairs or problems with the plant physical facilities could be related to the iron addition.

In the sludge filter and drying operation a considerable loss in service life was noted for some of the equipment parts. There was no evidence that could relate these problems to the pickle liquor addition. The sludge dewatering characteristics changed markedly in 1970 because of the change in the waste water properties. The waste water changes in 1969 prior to pickle liquor addition also affected the sludge dewatering operation. Any maintenance problems in the sludge filtering and drying operation were most likely related to the waste water characteristic changes.

G. Effect of the Iron Addition on the Ferric Chloride Demand

Ferric chloride was used to condition the thickened waste sludge prior to filtration. The initial thoughts were that if ferrous iron was added to the East Plant and the iron concentration in the East Plant waste sludge was increased, possibly the ferric chloride requirements would decrease. The ferric chloride used per dry solids production was tabulated on a daily basis and compared to quantities used in 1968 and 1969. Table 7 lists the monthly average ferric chloride use for three years.

TABLE 7

MONTHLY AVERAGE FERRIC CHLORIDE USE REQUIREMENTS FOR SLUDGE CONDITIONING

MONTH	Average Ferric Chloride Use Lbs. Anhydrous $FeCl_3$ per Dry Tons Recovered Solids		
	1968	1969	1970
January	211.82	218.62	228.75
February	213.22	206.32	229.98
March	206.46	209.06	238.53
April	209.49	199.36	194.46
May	203.42	211.45	215.52
June	220.11	240.26	226.78
July	234.04	232.74	260.08
August	223.47	219.50	231.15
September	226.62	254.63	245.62
October	239.73	257.18	262.69
November	251.10	236.91	257.63
December	223.83	229.33	238.03
Average	221.94	226.28	235.77

The data indicates that no reduction was obtained in the ferric chloride requirements for sludge conditioning. As a result of the changes in the characteristics of the raw sewage, comparison of these three years was not really valid. The solids production for 1970 was much different than for the previous years as shown in Figure 12. Working with a lower sludge age and a less stable sludge was probably the reason for the greater ferric chloride usage per ton of solids recovered. Additional data collection is necessary before a review should be made. The sewage properties and the resultant effect on the mixed liquor quality plays an important role in the sludge dewatering characteristics and therefore data from years with similar sewage should be compared. Possibly in the years to come, this data may be obtained.

SECTION X

ACKNOWLEDGEMENTS

This report was written by Raymond D. Leary, Chief Engineer and General Manager; Lawrence A. Ernest, Director of Laboratory; Roland S. Powell, Assistant Director of Laboratory; and Richard M. Manthe, Laboratory Supervisor of Research.

The authors gratefully acknowledge the assistance of the A. O. Smith Corporation of Milwaukee, Wisconsin for their complete cooperation, financial assistance and engineering expertise throughout the study period. We wish to acknowledge Mr. S. K. Rudorf and other staff members of A. O. Smith Corporation, especially Mr. Milton Johnson, whose knowledge and advice have proved invaluable.

Also acknowledged is the Water Quality Office of the Environmental Protection Agency for the financial assistance and technical advice through the project officer, Dr. Robert Bunch.

The assistance from the U. S. Steel Corporation through Mr. George J. Behrens, Chief Engineer, in supplying pickle liquor on a temporary basis in November and December 1970 was appreciated. Without the cooperation from the U. S. Steel Corporation, it would have been necessary to discontinue the project due to a shortage of iron.

The assistance of laboratory technician, Miss Gloria Aldenhoff and all laboratory staff members for their laboratory analyses as well as other Sewerage Commission personnel who have contributed to the success of this project is greatly appreciated.

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SECTION XII

NOMENCLATURE AND GLOSSARY

Phosphorus Nomenclature

1. Total Phosphorus (TP).

   All the phosphorus present in sample (whether in the soluble or insoluble state and present as ortho, poly, organic, etc., phosphorus compounds) which is converted by ternary acid digestion to soluble orth-phosphate.

2. Total Soluble Phosphorus (TSP).

   All the phosphorus compounds in the sample filtrate converted by ternary acid digestion to orth-phosphate.

3. Soluble Orho-Phosphate (SOP).

   All phosphorus measured by direct colorimetric analysis of sample filtrate. (Angel Reeve Glass Fiber Pad No. 934AB).

Iron Nomenclature

1. Total Iron.

   All the iron present in the sample.

2. Total Soluble Iron.

   All the iron compounds in the sample filtrate. (Filtered thru Angel Reeve Glass Fiber Pad No. 934AB).

Glossary

1. BOD - five day biochemical oxygen demand.
2. COD - chemical oxygen demand.
3. DO - dissolved oxygen.
4. EP - East Plant.
5. EPE - East Plant effluent.
6. MGD - million gallons/day.
7. ML - mixed liquor.

8. MLSS - mixed liquor suspended solids.
9. MLVSS - mixed liquor volatile suspended solids.
10. N - nitrogen.
11. P - phosphorus.
12. SDI - sludge density index.
13. SOP - soluble ortho-phosphate.
14. SS - screened sewage.
15. TP - total phosphorus.
16. TSP - total soluble phosphorus.
17. WP - West Plant.
18. WPE - West Plant effluent.

SECTION XIII

APPENDIX

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APPENDIX A

ACTINOMYCETACEAE, GENUS NOCARDIA

In February, 1969 following a reduction in plant loading the East Plant (a 115 mgd secondary portion of the 200 mgd Jones Island activated sludge waste water treatment) operated by the Sewerage Commission of the City of Milwaukee suddenly developed a heavy growth of floating solids and microorganisms. Microscopic examination of the floating material by personnel from the Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Marquette University, University of Wisconsin-Madison and the Commission indicated that the principal microorganism in the foam belonged to the ACTINOMYCETACEAE, Genus NOCARDIA. The predominant species of NOCARDIA were the proteolytic type commonly found in soils and frequently in sewage associated with the break down of paper cellulose.

This type of floating material, which had never been noted previously, appeared in all portions of the East Plant where mixed liquor or return sludge were being aerated. Chemical analysis on the floating material indicated that it contained 85 percent organic matter and 31 percent hexane soluble material.

Attempts made to reduce the floating material with regular defoaming agents were unsuccessful, and vacuum skimming of the aeration tanks and clarifier feed channels was instituted.

Surprisingly, no floating material appeared in the heavily loaded West Plant (85 mgd secondary portion of the 200 mgd Jones Island Plant) which received the same screened sewage as the East Plant. During this period (February 18th to March 10th) when the floating material first appeared in the East Plant, the food to microorganism ratio (lb BOD applied per day/lb mixed liquor volatile suspended solids under aeration) averaged 0.312 in the East Plant and 0.543 in the West Plant. During this period there were no reductions in the plant efficiencies as measured by the BOD and suspended solids removal.

The settling characteristics of the mixed liquors were not affected as indicated by the average S.D.I. of 1.11 in the East Plant and 1.18 in the West Plant.

In an attempt to overcome this foam problem, the food to microorganism ratio in the East plant was gradually increased by reducing the mixed liquor suspended solids and by increasing the BOD applied. The quantity of air applied was reduced from an average of 1.44 to 1.18 cu ft/per gal of sewage.

The quantity of the floating material has been greatly reduced by the skimming operation and/or by the changed loading and air rates or by the weather or other conditions beyond the control of the plant operators. Figures 18 and 19 are pictures of the froth.

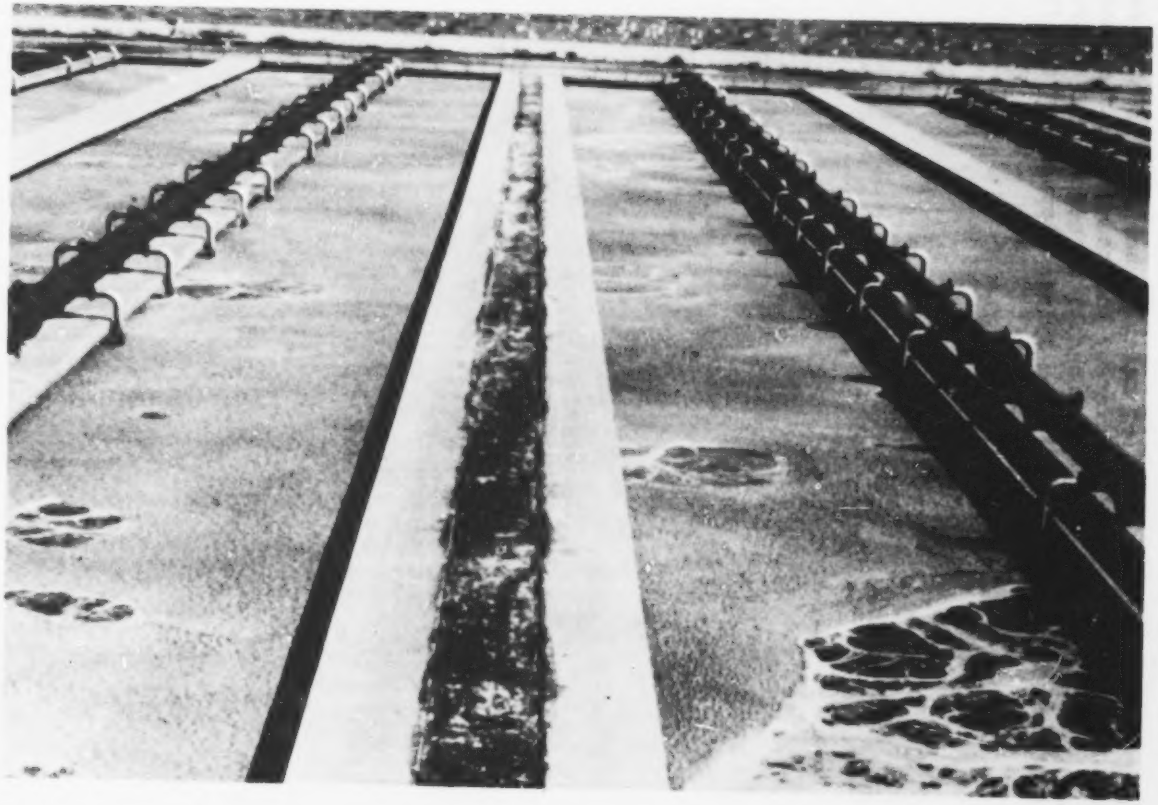
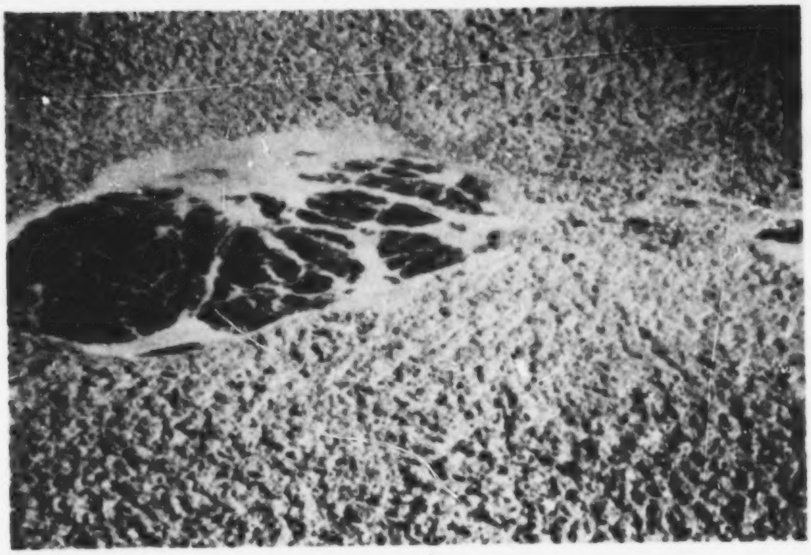
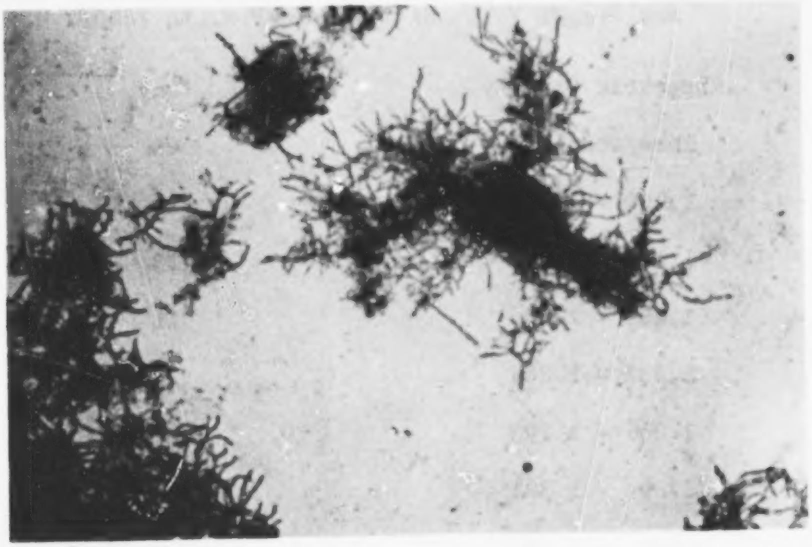


Figure 18

Actinomycetaceae, Genus Nocardia



March 1970 Nocardia Froth on East Plant Aeration Tank



Microscopic Examination (430x), Nocardia Froth from East Plant. Stained with Malchite Green - Safranin

Figure 19

Actinomycetaceae, Genus Nocardia

APPENDIX B

June 9, 1970

TO: Mr. M. Johnson (A. O. Smith Corporation)

cc: Mr. L. Ernest, Mr. R. Powell, Mr. D. Nelson

Effective immediately changes will be made in the rate of pickle liquor addition to reduce the total iron added and to add at two different rates to correspond to day and night East Plant mixed liquor flow variations. The following Table is to be used to determine the gallons per minute of pickle to be added for the different specific gravities.

For Addition of 10 mg/l Fe in the day (7:00/A.M. to 5:00/P.M.) and 8 mg/l Fe at night (5:00/P.M. to 7:00/A.M.)

Specific Gravity	G. P. M. Day	G. P. M. Night
less than 1.149	20	28
1.150 - 1.178	16	13
1.179 - 1.208	13	10.5
1.209 - 1.236	11	9.0
1.237 - 1.265	9.5	8.0
1.266 - 1.293	8.5	7.0
1.294 - 1.321	7.5	6.0
1.322 - 1.350	7.0	5.5
Greater than 1.351	6	4.5

Richard M Manthe

Richard M. Manthe
Supervisor

APPENDIX C

Phosphorus Determination with Technicon Autoanalyzer

Reagents:

A. Ammonium Molybdate - Dissolve 200 gm of $(NH_4)_6 Mo_7O_{24} \cdot 4H_2O$ in 10 liters of distilled water. Add 1680 ml. of c. H_2SO_4 and dilute to 20 liters.

B. ANSA Stock Solution - Dissolve 219 gm $Na_2S_2O_5$ and 8 gm Na_2SO_3 in 700 ml of distilled water (temperature<50°C), add 4 gm of 1-amino - 2 - naphthol - 4 - sulfonic acid (ANSA). Dilute to 2 liters. For daily use prepare a 1:10 dilution.

C. Phosphorus Standard Curve - Use undigested standards from 0.1 to 1.2 mg/l - P in increments of 0.1 mg/l - P from a 1000 mg/l - P stock solution.

D. Ternary Acid Mixture - Add 100 ml of 96% H_2SO_4 to 500 ml of 70% HNO_3, mix. Add 200 mls 70% $HClO_4$, mix and cool.

Sample Preparation:

A. Total Phosphorus

1. Mix unfiltered sample and pipette into a 100 ml volumetric flask (20 ml effluent, 5 ml for sewage).

2. Add 5 ml of ternary acid mixture and 3 glass beads.

3. Heat on hot plate to dense white fumes of perchloric acid and continue heating for 5 minutes. Then remove from hot plate and allow to cool.

4. Add 20 ml of distilled water, bring to a boil for 5 minutes and cool.

5. Add 1 drop of phenolphthalein indicator and neutralize with 10 N NaOH to a faint pink color.

6. Just discharge the pink color with 1 N H_2SO_4, dilute to 100 ml and mix

7. Transfer solution to the sampling cup of the autoanalyzer.

8. Obtain the phosphorus concentration of the sample from the standard curve.

B. Total Soluble Phosphorus

1. Same as total phosphorus, except the aliquot is filtered through an Angel Reeves glass fiber pad 934 AH.

C. Soluble Ortho - Phosphate

1. Filter through an Angel Reeves glass fiber pad 934 AH.
2. Dilute filtrate if needed.
3. Place in sampling cup of autoanalyzer.

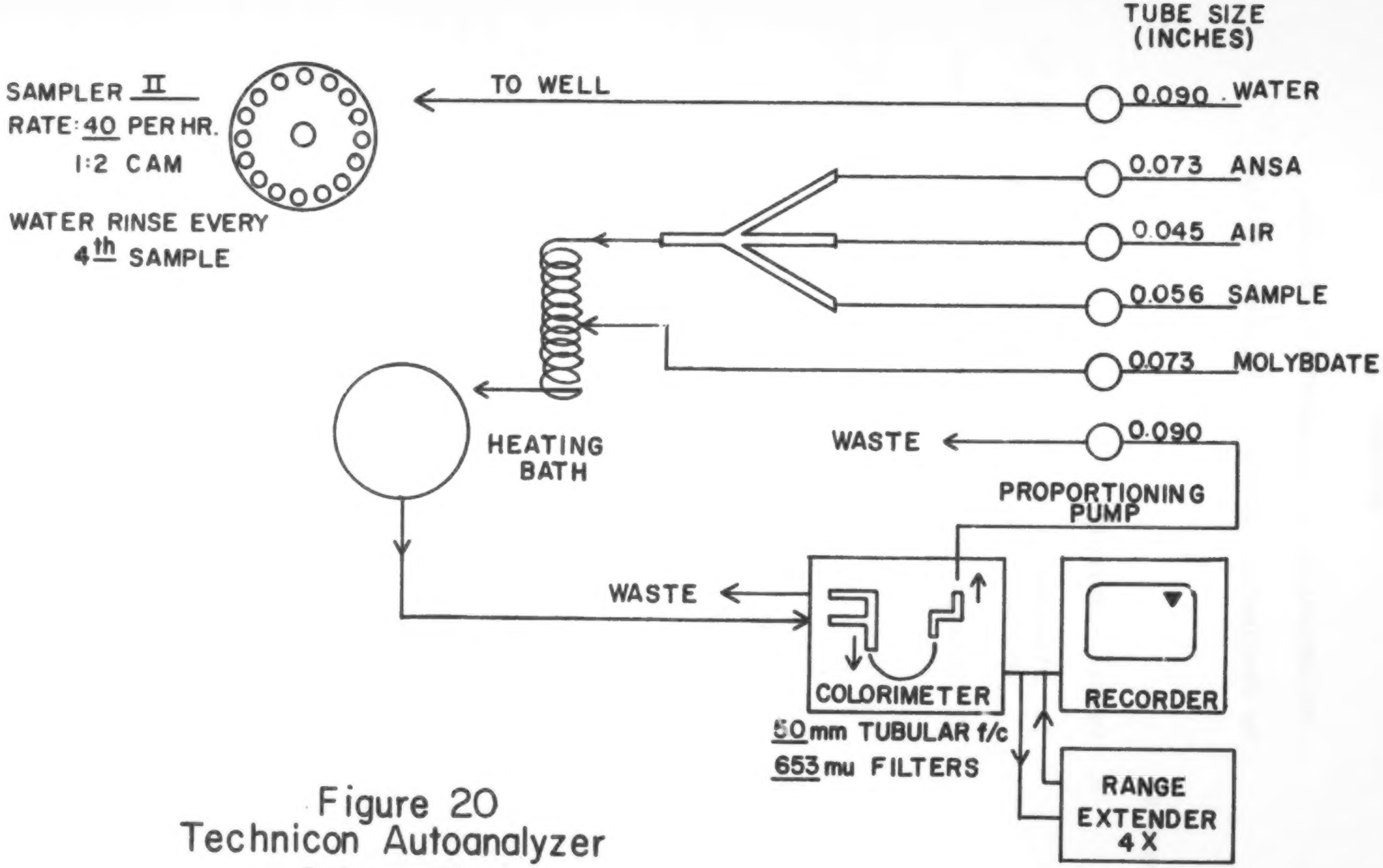


Figure 20
Technicon Autoanalyzer
Schematic

APPENDIX D

Determination of Phosphorus in Sludges by Gravimetric Quinoline Molybdate Method

Reagents:

A. Citric - Molybdic Acid Reagent.

1. Dissolve 54 gm 100% molybdic anhydride ($Mo\ O_3$) and 12 gm NaOH in 400 ml hot water and cool.
2. Dissolve 60 gm citric acid in 140 ml HCl and 200 ml water.
3. Gradually add molybdic solution to citric acid solution with stirring, cool, filter and dilute to 1 liter.

B. Quinoline Solution.

1. Dissolve 50 ml synthetic quinoline with stirring in mixture of 60 ml HCl and 300 ml water, cool and dilute to 1 liter.

Procedure:

Pipette a 50 ml aliquot from the remaining sample described in the iron procedure Appendix F Part A "Treatment of Sample", to a 500 ml erlenmeyer flask. Add 30 ml citric molybdic acid, boil 3 minutes, remove from heat, add 10 ml of quinoline with continuous swirling and cool. Filter through a Gooch containing a glass fiber filter pad, and wash with 25 ml portions of water. Dry at 250°F, cool in desiccator to constant weight. Weigh as $(C_9H_7N)_3\ H_3\ [PO_4 \cdot 12\ Mo\ O_3]$.

Calculation:

$$\%P = \frac{\text{(Wt-Reagent Blk) (Gravimetric factor .01400)}}{\text{Wt of Sample}}$$

APPENDIX E

Determination of Ferrous Iron in Pickle Liquor by Volumetric Dichromate Method

Reagents:

A. Sulfuric Acid 1:4

B. Phosphoric Acid 1:4

C. Mercuric Chloride

D. Potassium Dichromate

E. Diphenylamine Sulfonate indicator
(See Appendix F)

Procedure:

Place a 100 ml aliquot of pickle liquor sample in a 1 liter flask and dilute to one liter. Pipette a 10 ml aliquot into a 250 ml beaker, add 10 ml of 1:4 sulfuric acid, 50 ml of 1:4 phosphoric acid and 0.3 ml of diphenylamine sulfonate indicator. Titrate immediately with 0.1N potassium dichromate to a permanent blue endpoint. Subtract 0.05 ml for an indicator correction.

Calculation:

$$\text{lbs Fe/gal} = \text{ml } 0.1N\ K_2Cr_2O_7 \times \text{factor of } .0466$$

$$\text{factor} = \frac{1000 \times 3.785 \times .005585}{454}$$

APPENDIX F

Determination of Iron in Sludges by Volumetric Dichromate Method

Reagents:

A. Hydrochloric Acid 1:1

B. Sulfuric Acid 1:4

C. Phosphoric Acid 1:4

D. Mercuric Chloride (saturated)

E. Potassium Dichromate (standard 0.1 N)

F. Stannous Chloride solution

   1. Dissolve 50 gm $SnCl_2$ in 100 ml of concentrated HCl, dilute with water to 500 ml. Store over clean metallic tin.

G. Diphenylamine Sulfonate indicator

   1. Dissolve 0.32 gms of barium diphenylamine in 100 ml of water.

H. Magnesium Nitrate solution

   1. Dissolve 950 gm P-free $Mg(NO_3)_2 \cdot 6H_2O$ in water and dilute to 1 liter.

Note: All reagents prepared with distilled water.

Procedure

Part A Treatment of Sample

1. Place a 1 gm sample in a silica dish, add 5 ml of $Mg(NO_3)_2$ solution, and evaporate. Then ignite at 500 to 600° for about 7 minutes. Add HCl and evaporate to dryness twice. Add HCl and wash solution into a 250 ml beaker with water, add 10 ml of HNO_3 and boil for three minutes. Cool solution in a water bath, filter into a 250 ml volumetric flask, wash filter paper and dilute to volume. This solution is used for both the iron and phosphorus determinations.

Take a 100 ml aliquot for the iron determination and save the remaining solution for the phosphorus determination.

2. Place the 100 ml aliquot into a 250 ml beaker, neutralize with ammonium hydroxide and heat but do not boil. Filter the solution, wash the precipitate, and discard filtrate. Dissolve precipitate into a 250 ml beaker using a 1:1 HCl solution, and wash paper thoroughly.

Procedure Part B Volumetric Dichromate Method

Concentrate the sample prepared in Part A on a hot plate to 100 ml, add stannous chloride drop by drop until sample is decolorized, cool and add 15 ml mercuric chloride solution. Let stand for three to five minutes, add 30 ml 1:4 phosphoric acid, 10 ml of 1:4 sulfuric acid, 4 to 5 drops of diphenylamine sulfonate indicator and titrate with 0.1N potassium dichromate to the purple end point.

Calculation:

$$\% \text{ Total Iron} = \frac{(\text{ml } 0.1 \text{ N } K_2Cr_2O_7 - .05)\ (.005585)}{\text{wt of sample}}$$

(.05 is indicator factor)

APPENDIX G

Determination of Nitrogen in Milorganite and Sludges

Reagents:

A. Sulfuric Acid 93-98% H_2SO_4, N-free

B. Mercuric Oxide, reagent grade, N-free

C. Potassium sulfate, reagent grade N-free

D. Salicylic Acid, reagent grade N-free

E. Thiosulfate solution

Dissolve 40 gm commercial $Na_2S_2O_3$ in 1 L H_2O.

F. Sodium Hydroxide

Dissolve 450 gm solid NaOH in water and dilute to 1 L. (sp. gr. of solution should be 1.36 or higher).

G. Methyl red indicator

Dissolve 1 gm methyl red in 200 ml alcohol

H. Sulfuric Acid Std 0.1N

Procedure:

Part A Treatment of Sample

Place a one gram sample in a Kjeldahl flask, add 40 ml H_2SO_4 containing 2 gm salicylic acid, swirl until well mixed and let stand. After sample has stood for a minimum of 20 minutes add 5 gm $N_2S_2O_3 \cdot 5H_2O$, swirl and let stand a minimum of 10 minutes. Place on an electric heater and heat sample with occasional swirling until in the liquid state, cool and add 15 gm K_2SO_4 and 0.7 gm HgO. Place back on the burner and boil briskly until sample turns a pale straw color. Wash down neck and sides of Kjeldahl flask with 5-10 ml conc. H_2SO_4 and continue burning for 2 hours.

Procedure: **Part B Determination**

Place cooled sample in a cooling bath and add 200 ml distilled water and let stand 10 minutes. Add 25 ml $Na_2S_2O_3$ solution plus two porcelain bumping disks and with the flask in an inclined position pour approximately 90 ml NaOH solution gently down sides so as to layer the NaOH. Immediately connect the flask to the distilling apparatus, agitate and distill into receiver containing the proper amount of 0.1N H_2SO_4. Collect about 150 ml of distillate and titrate excess standard 0.1N H_2SO_4 with standard 0.1N NaOH using methyl red indicator.

Calculation:

$$\% N = \frac{(\text{ml Std. } H_2SO_4 \text{ x normality} - \text{ml NaOH x normality}) \text{ mol wt N}}{\text{wt of sample x 1000}} \text{ x 100}$$

APPENDIX H
PLANT OPERATIONAL DATA

JANUARY 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Th	935	796	823	14.9	12.0	153	21	16	86.3	89.5	150	10.5	14.0	93.0	90.7					
2	F	1020	744	744	27.1	27.1	256	24	22	90.6	91.4	295	11.0	12.8	96.3	95.7					
3	Sa	866	705	713	18.6	17.7	190	21	22	88.9	88.4	180	5.0	14.0	97.2	91.9					
4	Su	675	588	604	12.9	10.5	150	21	15	86.0	90.0	155	8.0	13.0	94.8	91.6					
5	M	987	573	616	41.9	37.6	277	12	17	95.7	93.9	325	10.5	18.5	96.8	94.3					
6	T	1050	691	730	34.2	30.5	247	16	24	93.5	90.3	310	10.5	16.0	96.6	94.8					
7	W	1090	771	785	29.3	28.0	364	35	19	86.7	92.8	265	21.0	18.0	92.1	93.2					
8	Th	1108	649	757	41.4	31.7	281	42	30	85.0	89.3	315	25.0	29.5	92.1	90.6	410	16	166	96.1	59.5
9	F	1075	733	814	31.8	24.3	262	31	86	88.2	67.2	320	16.0	48.0	95.0	85.0	465	28	20	94.0	95.7
10	Sa	776	670	707	13.7	8.9	158	17	14	89.2	91.1	190	10.0	16.0	94.7	91.6	478	75	137	84.8	71.3
11	Su	732	575	632	21.4	13.7	158	11	15	93.0	90.5	145	7.2	12.0	95.0	91.7	322	57	67	82.3	79.2
12	M	1054	621	719	41.1	31.8	273	18	21	93.4	92.3	300	9.5	20.5	96.8	93.2	229	38	45	83.4	80.3
13	T	1039	692	691	33.4	33.5	261	8	16	96.9	93.9	350	6.2	9.8	98.2	97.2	600	30	51	95.0	91.5
14	W	1054	681	763	35.4	27.6	262	4	13	98.5	95.0	310	12.0	19.0	96.1	93.9	756	50	53	93.4	93.0
15	Th	1080	774	791	28.3	26.8	341	20	21	94.1	93.8	280	8.5	20.5	97.0	92.7					
16	F	1119	878	847	21.5	24.3	316	53	31	83.2	90.2	275	31.0	12.5	88.8	95.3	585	41	45	93.0	92.3
17	Sa	878	775	743	11.7	15.4	181	39	12	78.5	93.4	160	24.0	10.0	85.0	93.8	525	101	42	80.8	92.0
18	Su	696	616	604	11.5	13.2	141	15	2	89.4	98.6	145	15.5	11.0	89.3	92.4	307	64	30	79.2	90.2
19	M	1010	653	609	35.3	39.7	256	25	10	90.2	96.1	280	18.5	12.5	93.4	95.5	204	35	37	82.8	81.9
20	T	1128	668	705	40.8	37.5	283	24	14	91.5	95.0	325	17.0	10.5	94.8	96.8	517	99	67	80.9	87.0
21	W	1320	733	733	44.5	44.5	581	19	12	96.7	97.9	270	21.0	11.5	92.2	95.7	642	86	72	86.6	88.8
22	Th	1026	724	739	29.4	28.0	231	17	13	92.6	94.4	270	15.5	11.0	94.3	95.9	571	76	55	86.7	90.4
23	F	1036	705	711	31.9	31.4	219	34	8	84.5	96.3	225	30.0	10.5	86.7	95.3	546	79	58	85.5	89.4
24	Sa	833	659	683	20.9	18.0	198	29	18	85.4	90.9	160	18.0	10.0	88.8	93.8	599	125	78	79.1	87.0
25	Su	1003	756	740	24.6	26.2	165	21	19	87.4	88.5	135	14.0	13.5	89.6	90.0	434	108	78	75.1	82.0
26	M	1150	823	830	28.4	27.8	242	14	16	94.2	93.4	260	14.1	12.6	94.6	95.2	290	88	78	69.7	73.1
27	T	1477	1199	1035	18.8	29.9	259	17	9	93.4	96.5	280	17.4	10.4	93.8	96.3	543	82	71	84.9	86.9
28	W	1526	1243	1314	18.5	13.9	294	18	24	93.9	91.8	240	12.5	19.5	94.8	91.9	567	93	83	83.6	85.4
29	Th	1151	1181	1151	Minus	0	242	20	19	91.7	92.1	280	16.5	11.0	94.1	96.1	547	83	96	84.8	82.4
30	F	1050	938	930	10.7	11.4	265	28	23	89.4	91.3	275	25.0	13.0	90.9	95.3	547	87	79	84.1	85.6
31	Sa	903	703	727	22.1	19.5	162	25	11	84.6	93.7	190	6.0	9.0	96.8	95.3	390	104	81	73.3	79.2
																	424	113	110	73.3	74.1

PLANT OPERATIONAL DATA

FEBRUARY 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Su	863	750	719	13.1	16.7	174	18	27	89.7	84.5	100	12.5	9.5	87.5	90.5	252	82	68	67.5	73.0
2	M	959	636	684	33.7	28.7	168	13	15	92.3	91.1	280	11.0	18.0	96.1	93.6	487	74	71	84.8	85.4
3	T	1014	715	753	29.5	25.7	229	15	21	93.4	90.8	240	12.0	12.5	95.0	94.8	525	78	76	85.1	85.5
4	W	1096	747	767	31.8	30.0	235	17	14	92.8	94.0	270	14.0	12.5	94.8	95.4	578	86	81	85.1	86.0
5	Th	1161	804	831	30.7	28.4	245	11	7	95.5	97.1	290	13.0	12.5	95.5	95.7	593	100	87	83.1	85.3
6	F	1333	957	1021	28.2	23.4	187	12	12	93.6	93.6	295	16.8	13.8	91.7	95.3	588	111	83	81.1	85.9
7	Sa	907	950	897	Minus	1.1	217	7	12	96.8	94.5	180	15.2	10.4	91.4	94.2	420	96	88	77.1	79.0
8	Su	964	658	777	31.7	19.4	167	7	13	95.8	92.2	130	8.0	8.5	93.8	93.5	274	75	76	72.6	73.3
9	M	1214	810	822	33.3	32.3	278	13	15	95.3	94.6	255	11.0	12.5	95.7	95.1	547	73	77	86.7	85.9
10	T	753	794	795	Minus	Minus	249	7	6	97.2	97.6	305	12.0	11.5	96.1	96.2	626	82	78	86.9	87.5
11	W	958	680	755	29.0	21.2	229	9	17	96.1	92.6	315	12.0	11.5	96.2	96.3	584	90	78	84.6	86.6
12	Th	1008	678	820	32.7	18.7	240	14	19	94.2	92.1	305	15.0	16.0	95.1	94.8	552	88	90	84.1	83.7
13	F	963	669	725	30.5	24.7	226	22	27	90.3	88.1	270	17.0	18.5	93.7	93.1	528	96	84	81.8	84.1
14	Sa	750	585	634	22.0	15.5	220	16	18	92.7	91.8	180	9.0	14.5	95.0	91.9	370	78	78	78.9	78.9
15	Su	692	561	559	18.9	19.2	137	11	16	92.0	88.3	170	10.2	13.6	94.0	92.0					
16	M	985	603	644	38.8	34.6	240	17	19	92.9	92.0	285	9.8	14.0	96.6	95.1	499	65	65	87.0	87.0
17	T	1041	704	733	32.4	29.6	250	20	15	92.0	94.0	275	12.5	12.2	95.5	95.6	519	87	73	83.2	85.9
18	W	1012	723	739	28.6	27.0	205	8	9	96.1	95.6	300	11.5	16.0	96.2	94.7	541	92	78	83.0	85.6
19	Th	1143	792	819	30.7	28.3	256	23	13	91.0	94.9	270	17.5	14.5	93.5	94.6	604	102	78	83.1	87.1
20	F	975	740	729	24.1	25.2	316	33	21	89.6	93.4	320	20.0	22.5	92.3	91.3	541	104	80	80.8	85.2
21	Sa	1116	809	873	27.5	21.8	261	28	24	89.3	90.8	155	13.0	24.0	91.6	84.5	424	98	88	76.9	79.2
22	Su	775	751	782	3.1	Minus	140	14	15	90.0	89.3	130	13.5	13.0	89.6	90.0	262	88	76	66.4	71.0
23	M	1014	658	757	35.1	25.3	269	16	19	94.1	92.9	260	8.6	11.4	96.7	95.6	520	58	66	88.8	87.3
24	T	1013	695	720	31.4	28.9	249	8	14	96.8	94.4	260	6.8	9.6	97.4	96.3	520	70	71	86.5	86.3
25	W	1056	743	757	29.6	28.3	257	8	9	96.9	96.5	300	10.5	9.6	96.5	96.8	569	87	76	84.7	86.6
26	Th	1094	670	709	38.8	35.2	294	12	12	95.9	95.9	320	12.5	14.5	96.1	95.5	573	87	82	84.8	85.7
27	F	1034	677	697	34.5	32.6	297	14	18	95.3	93.9	325	15.5	19.0	95.2	94.2	582	80	76	86.3	86.9
28	Sa	815	656	648	19.5	20.5	204	27	16	86.8	92.2	190	24.0	15.4	87.4	91.9	398	97	73	75.6	81.7
29																					
30																					
31																					

PLANT OPERATIONAL DATA

MARCH 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Su	1105	629	782	43.1	29.2	208	19	19	90.9	90.9	170	10.0	15.4	94.1	90.9	316	81	75	74.4	76.3
2	M	1201	848	923	29.4	23.1	259	13	20	95.0	92.3	320	10.5	22.5	96.7	93.0	563	66	71	88.3	87.4
3	T	1042	900	824	13.6	20.9	274	13	16	95.3	94.2	185	10.0	13.5	94.6	92.7	451	82	76	81.8	83.1
4	W	1093	786	796	28.1	27.2	267	19	28	92.9	89.5	280	7.0	28.0	97.5	90.0	516	74	88	85.7	82.9
5	Th	1067	805	755	24.6	29.2	250	16	15	93.6	94.0	295	16.0	20.0	94.6	93.2	538	98	84	81.8	84.4
6	F	1035	789	804	23.8	22.3	228	35	37	84.6	83.8	265	21.5	38.0	91.9	80.0	550	108	103	80.4	81.3
7	Sa	995	763	810	23.3	18.6	190	22	22	88.4	88.4	230	14.0	31.0	93.9	86.5	453	97	87	78.6	80.8
8	Su	852	659	747	22.7	12.3	185	14	20	92.4	89.2	135	7.5	20.0	94.4	85.2	272	76	72	72.1	73.5
9	M	1381	883	1020	36.1	26.1	249	8	14	97.2	94.4	295	6.8	15.2	97.7	94.8	513	58	59	88.7	88.5
10	T	1114	868	933	22.1	16.2	242	6	9	97.5	96.3	300	8.5	17.5	97.2	94.2	572	71	68	87.6	88.1
11	W	1142	790	844	30.8	26.1	271	9	9	96.7	96.7	360	8.0	14.2	97.8	96.1	601	95	88	84.2	85.4
12	Th	1121	788	787	29.7	29.8	309	11	8	96.4	97.4	305	8.5	12.6	97.2	95.9	583	92	83	84.2	85.8
13	F	1046	708	734	32.3	29.8	214	20	11	90.7	94.9	305	19.0	34.5	93.8	88.7	585	112	90	80.9	84.6
14	Sa	858	701	714	18.3	16.8	226	19	19	91.6	91.6	185	14.0	26.5	92.4	85.7	396	97	85	75.5	78.5
15	Su	761	662	650	13.0	14.6	178	22	20	87.6	88.8	140	27.0	17.5	80.7	87.5	268	82	70	69.4	73.9
16	M	961	622	633	35.3	34.1	212	15	10	92.9	95.3	240	10.5	27.5	95.6	88.5	526	73	73	86.1	86.1
17	T	1047	688	728	34.3	30.5	254	17	20	93.3	92.1	350	14.0	19.0	96.0	94.6	611	93	76	84.8	87.6
18	W	1024	711	729	30.6	28.8	233	9	11	96.1	95.3	320	14.5	24.5	95.5	92.3	599	92	85	84.6	85.8
19	Th	1013	613	754	39.5	25.6	336	17	17	94.9	94.9	280	13.0	23.5	95.4	91.6	502	99	88	80.3	82.5
20	F	944	610	656	35.4	30.5	216	10	13	95.4	94.0	225	11.6	14.0	94.8	93.8	464	85	79	81.7	83.0
21	Sa	928	722	754	22.2	18.8	204	24	15	88.2	92.6	170	14.6	18.0	91.4	89.4	386	98	83	74.6	78.5
22	Su	868	741	768	14.6	11.5	146	25	18	82.9	87.7	115	13.0	26.0	88.7	77.4	249	96	82	61.4	67.1
23	M	1067	762	821	28.6	23.1	263	13	18	95.1	93.2	265	9.5	21.0	96.4	92.1	505	74	75	85.3	85.1
24	T	1104	801	822	27.4	25.5	283	18	25	93.6	91.2	315	15.0	19.5	95.2	93.8	572	73	71	87.2	87.6
25	W	1046	791	827	24.4	20.9	235	11	17	95.3	92.8	265	10.0	27.0	96.2	89.8	504	77	71	84.7	85.9
26	Th	1390	1166	961	16.1	30.9	249	13	15	94.8	94.0	245	12.5	25.0	94.9	89.8	528	78	76	85.2	85.6
27	F	1064	870	901	18.2	15.3	169	17	31	89.9	81.7	215	14.5	39.0	93.3	81.9	480	91	93	81.0	80.6
28	Sa	895	787	785	12.1	12.3	184	13	21	92.9	88.6	165	12.0	33.5	92.7	79.7	346	95	79	72.5	77.2
29	Su	897	774	792	13.7	11.7	172	29	24	83.1	86.0	95	9.5	20.5	90.0	78.4	235	78	72	66.8	69.4
30	M	1088	738	765	32.2	29.7	251	28	26	88.8	89.6	270	11.0	32.5	95.9	88.0	533	70	70	86.9	86.9
31	T	1037	745	783	28.2	24.5	188	16	6	91.5	96.8	270	13.0	13.5	95.2	95.0	540	89	72	83.5	86.7

PLANT OPERATIONAL DATA

APRIL 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	W	1285	858	863	33.2	32.8	253	31	20	87.7	92.1	250	13.0	10.0	94.8	96.0	516	96	83	81.4	83.9
2	Th	1243	1097	1132	11.7	8.9	200	14	15	93.0	92.5	210	11.5	9.5	94.5	95.5	443	85	75	80.8	83.1
3	F	1023	806	869	21.2	15.1	190	27	28	85.8	85.3	240	16.5	8.5	93.1	96.5	449	92	72	79.5	84.0
4	Sa	952	831	845	12.7	11.2	206	34	16	83.4	92.2	200	11.5	4.6	94.3	97.7	351	89	68	74.6	80.6
5	Su	898	770	811	14.3	9.7	172	16	11	90.7	91.4	115	6.0	6.8	94.8	94.1	222	66	61	70.3	72.5
6	M	1007	742	811	26.3	19.5	219	23	13	89.5	94.1	220	14.0	12.0	93.6	94.5	434	75	58	82.7	86.6
7	T	1075	740	773	31.2	28.1	186	5	4	97.3	97.8	230	7.0	5.8	97.0	97.5	497	68	64	86.3	87.1
8	W	1117	734	786	34.3	29.6	224	9	8	96.0	96.4	230	9.0	6.0	96.1	97.4	527	84	67	84.1	87.3
9	Th	1117	754	818	32.5	26.8	255	14	15	94.5	94.1	245	7.0	5.0	97.1	98.0	561	83	65	85.2	88.4
10	F	1125	755	775	32.9	31.1	238	16	12	93.3	95.0	245	10.5	4.0	95.7	98.4	585	86	67	85.3	88.5
11	Sa	942	746	794	20.8	15.7	176	17	12	90.3	93.2	165	8.4	3.8	94.9	97.7	377	86	68	77.2	82.0
12	Su	832	701	684	15.7	17.8	127	6	12	95.3	90.6	100	5.2	6.4	94.8	93.6	257	71	62	72.4	75.9
13	M	821	573	624	30.2	24.0	148	2	7	98.6	95.3	160	6.6	11.2	95.9	93.0	361	62	57	82.8	84.2
14	T	1087	794	810	27.0	25.5	182	11	4	94.0	97.8	200	2.2	6.4	98.9	96.8	439	64	59	85.4	86.6
15	W	1100	840	917	23.6	16.6	219	9	6	95.9	97.3	220	5.4	7.0	97.5	96.8	468	63	64	86.5	86.3
16	Th	1004	777	855	22.6	14.8	227	10	7	95.6	96.9	245	6.0	8.0	97.6	96.7	450	72	63	84.0	86.0
17	F	1120	811	807	27.6	27.9	266	44	7	83.5	97.4	260	18.0	6.2	93.1	97.6	578	99	61	82.9	89.4
18	Sa	1055	817	804	22.6	23.8	259	27	5	89.6	98.1	165	13.5	9.2	91.8	94.4	464	90	65	80.6	86.0
19	Su	879	715	807	18.7	8.2	174	24	11	86.2	93.7	120	17.0	13.2	85.8	89.0	287	94	70	67.2	75.6
20	M	1085	653	684	39.8	37.0	235	15	9	93.6	96.2	225	4.8	17.5	97.9	92.2	462	56	54	87.9	88.3
21	T	1159	792	813	25.2	23.2	252	10	11	96.0	95.6	240	5.2	11.5	97.8	95.2	524	63	65	88.0	87.6
22	W	1143	800	865	30.0	24.3	249	13	10	94.8	96.0	225	4.4	9.6	98.0	95.7	522	71	67	86.4	87.2
23	Th	1103	809	818	26.7	25.8	256	4	8	98.4	96.9	235	5.8	11.8	97.5	95.0	532	74	67	86.1	87.4
24	F	1096	796	799	27.4	27.1	256	22	14	91.4	94.5	240	9.0	18.0	96.3	92.5	513	79	64	84.6	87.5
25	Sa	888	734	747	17.3	15.9	173	21	11	87.9	93.6	145	9.4	13.2	93.5	90.9	340	75	62	77.9	81.8
26	Su	796	685	709	13.9	10.9	172	5	6	97.8	97.3	75	4.4	20.0	94.1	73.3	208	56	58	73.1	72.1
27	M	1021	790	754	22.6	26 2	302	25	16	91.7	94.7	210	4.6	25.0	97.8	88.1	467	54	56	88.4	88.0
28	T	1037	784	755	24.4	27.2	218	52	26	76.1	88.1	215	18.0	19.0	91.6	91.2	495	106	72	78.6	85.5
29	W	1091	768	847	29.6	22.4	216	19	16	91.2	92.6	250	10.5	22.0	95.8	91.2	514	85	78	83.5	84.8
30	Th	895	727	820	18.8	8.4	155	22	48	85.8	69.0	215	6.0	30.0	97.2	86.0	460	70	117	84.8	74.6
31																					

PLANT OPERATIONAL DATA

MAY 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	F	1031	695	771	32.6	25.2	233	17	80	92.7	65.7	220	12.0	35.5	94.5	83.9	499	81	148	83.8	70.3
2	Sa	958	737	792	23.1	17.3	180	15	26	91.7	85.6	225	6.4	13.5	97.2	94.0	417	76	83	81.8	80.1
3	Su	776	700	676	9.8	12.9	129	7	11	94.6	91.5	80	4.2	20.5	94.8	74.4	245	63	63	74.3	74.3
4	M	1007	721	708	28.4	29.7	198	6	17	97.0	91.4	210	4.4	37.0	97.9	82.4	475	60	70	87.4	85.3
5	T	1044	709	746	32.1	28.5	252	9	12	96.4	95.2	230	5.2	33.0	97.7	85.7	543	75	66	86.2	87.8
6	W	1061	730	789	31.2	25.6	247	8	4	96.8	98.4	295	10.0	8.5	96.6	97.1	606	80	66	86.8	89.1
7	Th	1048	769	792	26.6	24.4	252	31	7	87.7	97.2	280	11.0	20.0	96.1	92.9	583	99	71	83.0	87.8
8	F	1029	851	775	17.3	24.7	258	128	17	50.4	93.4	245	62.0	13.0	74.7	94.7	530	210	79	60.4	85.1
9	Sa	813	704	720	13.4	11.4	216	37	15	82.9	93.1	145	14.2	10.6	90.2	92.7	351	92	63	73.8	82.1
10	Su	794	625	641	21.3	19.3	187	31	19	83.4	89.8	120	9.0	10.2	92.5	91.5	253	69	60	72.7	76.3
11	M	960	682	649	29.0	32.4	214	11	18	94.9	91.6	235	5.6	11.5	97.6	95.1	479	65	59	86.4	87.7
12	T	820	558	671	32.0	18.2	233	12	19	94.8	91.8	155	5.0	5.8	96.8	96.3	372	63	54	83.1	85.5
13	W	897	698	679	22.2	24.3	121	15	13	87.6	89.3	145	4.6	5.0	96.8	96.6	338	60	51	82.2	84.9
14	Th	893	693	664	22.4	25.6	117	5	7	95.7	94.0	160	3.8	8.0	97.6	95.0	356	60	56	83.1	84.3
15	F	868	703	739	19.0	14.9	140	21	8	85.0	94.3	115	9.0	4.2	92.2	96.3	280	75	60	73.2	78.6
16	Sa	870	765	770	12.1	11.5	128	8	6	93.8	95.3	110	8.2	3.6	92.5	96.7	355	82	61	76.9	82.8
17	Su	824	819	781	0.6	5.2	109	37	9	66.1	91.7	85	14.0	5.2	83.5	93.9	197	82	49	58.4	75.1
18	M	1051	732	778	30.4	26.0	227	13	6	94.3	97.4	230	8.5	11.5	96.3	95.0	448	62	52	86.2	88.4
19	T	1097	797	820	27.3	25.3	272	19	15	93.0	94.5	235	8.0	5.0	96.6	97.9	502	62	58	87.6	88.4
20	W	1155	845	880	27.8	23.8	270	22	8	91.9	97.0	215	12.2	5.4	94.3	97.5	509	80	64	84.3	87.4
21	Th	1001	831	805	17.0	19.6	217	29	26	86.6	88.0	245	17.0	15.0	93.1	93.9	504	94	92	81.3	81.7
22	F	1067	813	836	23.8	21.6	245	35	11	85.7	95.5	245	13.0	5.5	94.7	97.8	508	94	71	81.5	86.0
23	Sa	859	697	672	18.9	21.8	133	7	5	94.7	96.2	215	5.0	4.0	97.7	98.1	351	59	69	83.2	80.3
24	Su	858	731	735	14.8	14.3	170	20	23	88.2	86.5	80	4.2	6.0	94.8	92.5	203	52	54	74.4	73.4
25	M	972	716	793	26.3	18.4	150	7	54	95.3	64.0	215	7.0	33.0	96.7	84.7	437	59	105	86.5	76.0
26	T	1023	789	804	22.9	21.4	216	7	15	96.8	93.1	230	4.0	7.0	98.3	97.0	502	68	62	86.5	87.6
27	W	1063	811	846	23.7	20.4	200	10	7	95.0	96.5	270	6.5	5.5	97.6	98.0	507	69	60	86.4	88.2
28	Th	953	793	735	16.8	22.9	192	98	9	47.4	95.3	255	40.0	15.5	84.3	93.9	504	158	43	68.7	91.5
29	F	990	874	794	11.7	19.8	209	141	15	32.5	92.8	235	66.0	9.0	71.9	96.2	484	176	41	63.6	91.5
30	Sa	765	613	722	19.9	5.6	135	7	11	94.8	91.9	122	6.0	13.5	95.1	88.9	267	54	53	79.8	80.1
31	Su	719	621	637	13.6	11.4	125	12	12	90.4	90.4	94	12.0	18.0	87.2	80.9					

PLANT OPERATIONAL DATA

JUNE 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	M	666	536	686	19.5		143	3	65	97.9	54.5	125	9.0	48.0	92.8	61.6	276	40	61	85.5	77.9
2	T	841	549	532	34.7	36.7	153	13	27	91.5	82.4	150	7.0	10.5	95.3	93.0	276	36	46	87.0	83.3
3	W	1041	838	882	19.5	15.3	158	4	6	97.5	96.2	170	4.6	5.6	97.3	96.7	383	50	41	86.9	89.3
4	Th	1050	818	905	22.1	13.8	167	9	11	94.6	93.4	190	6.8	10.0	96.4	94.7	411	43	55	89.5	86.6
5	F	957	784	840	18.1	12.2	164	13	12	92.1	92.7	190	10.0	6.0	94.7	96.8	393	56	50	85.8	87.3
6	Sa	898	821	832	8.6	7.3	196	23	17	88.3	91.3	165	7.5	23.0	95.5	86.1	355	52	49	85.4	86.2
7	Su	802	681	746	15.1	7.0	174	9	5	94.8	97.1	86	5.0	7.8	91.9	90.9	205	46	40	77.6	80.5
8	M	933	704	863	24.5	7.5	173	9	46	94.8	73.4	175	6.4	17.5	96.3	90.0	404	44	73	89.1	81.9
9	T	937	730	802	22.1	14.4	166	13	11	92.2	93.4	205	11.4	12.0	94.4	94.1	428	57	46	86.7	89.3
10	W	983	747	758	24.1	22.9	192	12	10	93.8	94.8	210	8.0	5.8	96.2	97.2	424	76	51	82.1	88.0
11	Th	975	712	887	27.0	9.0	177	9	98	94.9	44.6	215	10.4	46.0	95.2	78.6	443	57	143	87.1	67.7
12	F	888	742	786	16.4	11.5	202	32	83	84.2	58.9	150	17.0	36.0	88.7	76.0	420	69	107	83.6	74.5
13	Sa	865	667	735	22.9	15.0	155	9	58	94.2	62.6	155	5.2	28.0	96.6	81.9	335	48	92	85.7	72.5
14	Su	762	702	702	7.9	7.9	138	22	21	84.1	84.7	102	7.6	13.0	92.5	87.3	234	44	47	81.2	79.9
15	M	1024	767	846	25.1	17.4	214	9	17	95.8	92.1	225	8.0	16.5	94.7	93.3	451	40	21	91.1	95.3
16	T	941	738	791	21.6	15.9	206	15	14	92.7	93.2	260	6.8	10.0	97.4	96.2	467	52	54	88.9	88.4
17	W	909	703	816	22.7	10.2	214	12	52	94.4	75.7	190	6.2	26.0	96.7	86.3	440	54	80	87.7	81.8
18	Th	897	643	788	28.3	12.2	190	28	97	85.3	48.9	200	8.0	38.0	96.0	81.0	586	72	151	87.7	74.2
19	F	1006	802	878	20.3	12.7	183	46	66	74.9	63.9	250	22.0	39.0	91.2	84.4	464	85	100	81.5	78.4
20	Sa	833	735	742	11.8	10.9	209	12	17	94.3	91.9	142	8.2	17.5	94.5	88.3	367	56	65	84.7	82.3
21	Su	754	534	700	29.2	7.2	133	11	24	91.7	82.0	88	3.0	23.0	96.6	73.9	207	42	46	79.7	77.8
22	M	883	659	692	25.4	21.6	183	3	18	98.4	90.2	215	2.6	29.5	98.8	86.3	427	38	60	91.1	85.9
23	T	882	692	720	21.5	18.4	171	6	25	96.5	85.4	200	4.6	20.0	97.7	90.0	427	48	88	88.8	79.4
24	W	887	681	741	23.2	16.5	189	9	69	95.2	63.5	230	4.2	29.0	97.8	87.3	458	53	114	88.4	75.1
25	Th	895	602	771	32.7	13.9	207	14	85	93.2	58.9	240	6.8	37.0	97.2	84.6	433	63	132	85.5	69.5
26	F	774	621	763	19.8	1.4	189	11	176	94.2	6.9	210	6.0	66.0	97.1	67.6	602	81	224	86.5	62.8
27	Sa	801	626	670	21.8	16.4	162	7	20	95.7	87.7	185	5.4	21.5	97.1	88.4	506	122	103	75.9	79.6
28	Su	802	673	771	16.1	3.9	147	11	18	92.5	87.8	120	6.6	26.5	94.5	77.9	246	29	73	88.2	70.3
29	M	842	665	752	21.0	10.7	192	12	24	93.8	87.5	220	4.0	29.0	98.2	86.8	400	46	68	88.5	83.0
30	T	809	652		19.4		170	11		93.5		220	3.8	46.0	98.3	79.1	387	42	138	89.1	64.3
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PLANT OPERATIONAL DATA

JULY 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	W	876	611	741	30.3	15.4	219	8	25	96.3	88.6	220	4.0	17.5	98.2	92.0	410	45	62	89.0	84.9
2	Th	811	681	727	16.0	10.4	165	5	12	97.0	92.7	180	4.0	16.0	97.8	91.1	406	48	58	88.2	85.7
3	F	944	672	693	28.8	26.6	180	5	10	97.2	94.4	230	5.4	16.0	97.7	93.0	404	52	55	87.1	86.4
4	Sa	745	697	696	6.4	6.6	100	6	8	94.0	92.0	155	6.0	14.5	96.1	90.6	290	54	60	81.4	79.3
5	Su	727	612	767	15.8		150	9	18	94.0	88.0	102	4.4	11.5	95.7	88.7	224	41	54	81.7	75.9
6	M	832	649	690	22.0	17.1	185	7	9	96.2	95.1	175	7.2	20.0	95.9	88.6	392	44	48	88.8	87.8
7	T	785	589	651	25.0	17.1	147	7	10	95.2	93.2	160	11.6	21.0	92.8	86.8	398	50	65	87.4	83.7
8	W	864	625	800	27.7	7.4	216	12	127	94.4	41.2	185		60.0		67.6	452	55	176	87.8	61.1
9	Th	880	706	819	19.8	6.9	204	50	104	75.5	49.0	230	25.0	54.0	89.2	76.5	436	97	134	77.8	69.3
10	F	802	727	644	9.4	19.7	208	129	46	38.0	77.9	185	42.0	30.0	77.3	83.8	419	150	91	64.2	78.3
11	Sa	766	638	699	16.7	8.7	164	50	23	69.5	86.0	145	30.5	18.0	79.0	87.6	310	92	67	70.3	78.4
12	Su	661	562	662	15.0		135	15	52	88.9	61.5	92	11.4	34.0	87.6	63.0	200	50	96	75.0	52.0
13	M	834	697	697	16.4	16.4	193	15	41	92.2	78.8	235	17.0	31.0	92.8	86.8	404	46	72	88.6	82.2
14	T	743	550	583	26.0	21.5	156	8	21	94.9	86.5	120	14.0	16.5	88.3	86.3	362	57	70	84.3	80.7
15	W	807	627	714	22.3	11.5	177	13	13	92.7	92.7	205	14.0	8.4	93.2	95.9	484	52	57	89.3	88.2
16	Th	851	625	675	26.6	20.7	206	13	14	93.7	93.7	180	10.0	7.2	94.4	96.0	418	52	48	87.6	88.5
17	F	762	650	640	14.7	16.0	127	75	7	40.9	94.5	170	44.0	6.0	74.1	96.5	387	139	50	64.1	87.1
18	Sa	719	621	625	13.6	13.1	168	21	14	87.5	91.7	120	11.0	5.2	90.8	95.7	280	54	44	80.7	84.3
19	Su	713	576	586	19.2	17.8	131	18	11	86.3	91.6	106	14.0	7.6	86.8	92.8	221	45	37	79.6	83.3
20	M	908	640	716	29.5	21.1	231	18	8	92.2	96.5	210	15.5	8.0	92.4	95.9	419	46	40	89.0	90.5
21	T	908	644	698	29.1	23.1	199	20	11	90.0	94.5	230	15.0	9.2	93.5	96.0	443	54	54	87.8	87.8
22	W	844	705	681	16.5	19.3	191	17	2	91.1	99.0	235	13.0	5.2	94.5	97.8	452	52	61	88.5	86.5
23	Th	794	594	630	25.2	20.7	191	20	6	89.5	96.9	215	22.0	6.2	89.8	97.1	450	60	48	86.7	89.3
24	F	930	730	784	21.5	15.7	205	20	10	90.2	95.1	210	14.0	7.0	93.3	96.7	448	58	43	87.1	90.4
25	Sa	748	734	722	1.9	3.5	195	30	26	84.6	86.7	100	13.0	6.4	87.0	93.6	255	46	43	82.0	83.1
26	Su	610	532	565	12.8	7.4	107	12	11	88.8	89.7	92	14.0	10.0	84.8	89.1	193	43	37	77.7	80.8
27	M	807	654	679	19.0	15.9	167	31	17	81.4	89.8	175	13.0	7.6	92.6	95.7	406	53	42	86.9	89.7
28	T	806	613	650	23.9	19.4	196	11	9	94.1	95.2	190	9.4	5.0	95.1	97.4	456	53	56	88.4	87.7
29	W	899	701	678	22.0	24.6	172	6	7	96.5	95.9	230	11.5	7.2	95.0	96.9	458	61	62	86.7	86.5
30	Th	823	585	624	28.9	24.2	227	19	18	91.6	92.1	165	12.0	6.8	92.7	95.9	416	51	52	87.7	87.5
31	F	741	573	573	22.7	22.7	168	14	12	91.7	92.9	140	10.0	7.0	92.9	95.0	406	60	61	85.2	85.0

PLANT OPERATIONAL DATA

AUGUST 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Sa	656	627	592	4.4	9.8	156	21	17	86.5	89.1	84	8.0	5.5	90.5	93.4	240	50	48	79.2	80.0
2	Su	700	621	657	11.3	6.1	126	17	14	86.5	88.9	66	12.0	7.5	81.8	88.6	180	42	35	76.7	80.6
3	M	736	574	597	22.0	18.9	153	8	3	94.8	98.0	150	11.5	4.5	92.3	97.0	395	45	37	88.6	90.6
4	T	847	634	643	25.1	24.1	169	4	8	97.6	95.3	170	9.0	9.0	94.7	94.7	420	59	53	86.0	87.4
5	W	871	609	648	30.1	25.6	194	12	16	93.8	91.8	220	6.2	11.0	97.2	95.0	370	52	59	85.9	84.1
6	Th	859	633	646	26.3	24.8	162	9	6	94.4	96.3	220	9.8	23.0	95.5	89.5	440	60	54	86.4	87.7
7	F	986	744	777	24.5	21.2	286	9	11	96.9	96.2	205	7.2	9.8	96.5	95.2	470	55	54	88.3	88.5
8	Sa	841	685	738	18.5	12.2	184	9	8	95.1	95.7	110	8.4	11.0	92.4	90.0	290	53	46	81.7	84.1
9	Su	661	583	629	11.8	4.8	142	8	7	94.4	95.1	98	6.6	6.8	93.3	93.1	190	50	45	73.7	76.3
10	M	902	577	634	36.0	29.7	221	14	8	93.7	96.4	255	9.6	11.8	96.2	95.4	420	42	42	90.0	90.0
11	T	894	633	655	29.2	26.7	198	7	9	96.5	95.5	205	10.2	12.8	95.0	93.8	445	53	41	88.1	90.8
12	W	893	638	698	28.6	21.8	177	12	8	93.2	95.5	190	7.4	7.2	95.8	96.2	435	58	37	86.7	91.5
13	Th	882	645	657	26.9	25.5	248	13	12	94.8	95.2	200	8.2	7.2	95.9	96.4	440	54	42	87.7	90.5
14	T	797	650	656	18.4	17.7	202	14	12	93.1	94.1	180	7.0	6.8	96.1	96.2	410	53	45	87.1	89.0
15	Sa	600	549	697	8.5		151	20	11	86.8	92.7	85	8.0	5.4	91.8	93.6	250	52	45	79.2	82.0
16	Su	625	505	644	19.2		123	13	20	89.4	83.7	82	7.2	10.2	91.2	85.1	200	43	64	78.5	68.0
17	M	822	625	721	24.0	12.3	198	14	23	92.9	88.4	190	7.8	10.0	96.0	94.7	405	42	52	89.6	87.2
18	T	828	602	644	27.3	22.2	164	11	13	93.3	92.1	220	11.0	9.0	95.0	95.9	440	62	54	85.9	87.7
19	W	846	603	655	28.7	22.6	198	15	12	92.4	93.9	205	9.4	7.0	95.4	96.6	450	63	62	86.0	86.2
20	Th	922	729	712	20.9	22.8	138	9	9	93.5	93.5	235	9.4	8.0	96.0	96.6	460	61	68	86.7	85.2
21	F	884	710	718	19.7	18.8	166	14	22	91.6	86.7	210	8.0	11.0	95.2	94.8	430	67	97	84.4	77.4
22	Sa	760	624	575	17.9	11.2	142	12	18	91.6	87.3	115	7.2	11.5	93.7	90.0	300	58	123	80.7	59.0
23	Su	638	563	707	11.8		131	5	17	96.2	87.0	215	8.8	12.2	95.9	94.3	200	45	62	77.5	69.0
24	M	790	589	639	25.4	19.1	167	7	11	95.8	93.4	195	8.8	11.0	95.5	94.4	420	45	64	89.3	84.8
25	T	856	559	637	34.7	25.6	139	7	11	95.0	92.1	86	5.8	11.6	93.3	86.5	440	57	80	87.0	81.8
26	W	866	618	715	28.6	17.4	175	6	18	96.6	89.7	220	8.6	11.2	96.1	94.9	440	59	77	86.6	82.5
27	Th	894	723	736	19.1	17.7	179	8	14	95.5	92.2	220	11.6	13.0	94.7	94.1	455	64	80	85.9	82.4
28	F	906	718	631	20.8	30.4	252	26	24	89.7	90.5	235	12.0	12.0	94.9	94.9	475	66	84	86.1	82.3
29	Sa	664	614	670	7.5		191	24	25	87.4	86.9	104	10.0	13.0	90.4	87.5	250	63	71	74.8	71.6
30	Su	629	597	529	5.1	15.9	137	8	24	94.2	82.5	94	7.8	12.8	91.7	86.4	215	46	84	78.6	60.9
31	M	915	710	682	22.4	25.5	206	9	27	95.6	86.9	230	8.6	17.5	96.3	92.4	430	42	80	90.2	81.4

PLANT OPERATIONAL DATA

SEPTEMBER 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	T	888	654	681	26.4	23.3	206	12	10	94.2	95.1	280	9.0	12	96.8	95.7	490	52	70	89.4	85.7
2	W	821	667	712	18.8	13.3	233	19	19	91.8	91.8	220	11	11	95.0	95.0	440	58	73	86.8	83.4
3	Th	719	586	587	18.5	18.4	167	16	25	90.4	85.0	190	11	17	94.2	91.1	360	60	84	83.1	76.3
4	F	896	609	644	32.0	28.1	223	18	19	91.9	91.5	210	13	15	93.8	92.9	460	73	82	84.1	82.2
5	Sa	813	665	756	18.2	7.0	176	10	16	94.3	90.9	120	6.8	13	94.3	89.2	300	49	70	83.7	76.7
6	Su	581	540		7.1		141	9		93.6		66	7.9		88.0		140	40		71.4	
7	M	706	604	621	14.4	12.0	164	15	34	90.9	79.3	90	11	14	87.8	84.4	200	38	56	81.0	72.0
8	T	901	585	656	35.1	27.2	186	4	13	97.9	93.0	250	8.6	12	96.6	95.2	450	43	64	90.4	85.8
9	W	835	692	703	17.1	15.8	162	3	5	98.2	96.7	170	9.4	12	94.5	92.9	430	49	59	88.6	86.3
10	Th	946	529	637	44.1	32.7	213	17	24	92.0	88.7	260	8.8	14	96.6	94.6	460	42	69	90.9	85.0
11	F	941	697	747	25.9	20.6	229	12	30	94.8	86.9	230	8.0	21	96.5	90.9	490	45	75	90.7	84.5
12	Sa	733	622	734	15.1		213	18	60	91.5	71.8	150	8.2	30	94.5	80.0	340	54	90	84.1	73.5
13	Su	611	596	600	2.5	1.8	120	9	24	92.5	80.0	110	12	17	89.1	84.5	210	42	62	79.5	69.8
14	M	760	572	649	24.7	14.6	184	9	43	95.1	76.6	190	8.8	27	95.4	85.8	360	38	87	89.4	75.8
15	T	731	488	590	33.2	19.3	178	10	31	94.4	82.6	160	8.0	14	95.0	91.3	320	36	59	88.6	81.3
16	W	928	670	713	27.8	23.2	203	15	23	92.6	88.7	230	8.6	13	96.3	94.3	430	44	68	89.6	84.0
17	Th	764	621	611	18.7	20.0	178	38	23	78.7	87.1	220	29	13	86.8	94.1	400	82	71	79.2	82.0
18	F	921	687	720	25.4	21.8	192	13	15	93.2	92.2	200	11	11	94.5	94.5	430	52	48	87.9	88.8
19	Sa	843	766	791	9.1	6.2	147	13	16	91.2	89.1	110	8.6	12	92.2	89.1	340	48	61	85.9	82.1
20	Su		678	769				23	30				8.6	10				42	62		
21	M	857	646	700	24.6	18.3	206	9	15	95.6	92.7	210	11	12	94.8	94.3	430	41	50	90.5	88.4
22	T	914	670	712	26.7	22.1	177	12	11	93.2	93.8	250	14	12	94.4	95.2	450	76	59	83.1	86.9
23	W	823	772	754	6.2	8.4	188	17	14	91.0	92.6	200	16	12	92.0	94.0	470	63	76	86.6	83.8
24	Th	813	576	625	29.2	23.1	155	32	34	79.4	78.1	160	37	22	76.9	86.3	330	82	66	75.2	80.0
25	F	883	716	818	18.9	7.4	196	23	37	88.3	81.1	180	12	14	93.3	92.2	340	32	66	90.6	80.6
26	Sa	827	775	768	6.3	7.1	160	24	21	85.0	86.9	120	17	8.5	85.8	92.9	250	65	52	74.0	79.2
27	Su	711	671	690	5.6	3.0	97	10	11	89.7	88.7	100	16	13	84.0	87.0	200	45	52	77.5	74.0
28	M	934	652	671	30.2	28.2	256	18	16	93.0	93.8	250	22	15	91.2	94.0	490	54	47	89.0	90.4
29	T	940	679	715	27.8	23.9	255	20	21	92.2	91.8	240	16	10	93.3	95.8	350	47	51	86.6	85.4
30	W	962	706	720	26.6	25.2	288	15	19	94.8	93.4	250	11	12	95.6	95.2	570	58	60	89.8	89.5
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PLANT OPERATIONAL DATA

OCTOBER 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Th	1042	755	822	27.5	21.1	276	13	14	95.3	94.9	260	11	13	95.8	95.0					
2	F	946	732	755	22.6	20.2	230	18	15	92.2	93.5	230	14	11	93.9	95.2	510	61	54	88.0	89.4
3	Sa	797	787	788	1.3	1.1	182	18	28	90.1	84.6	140	10	15	92.9	89.3	310	58	65	81.3	79.0
4	Su	797	629	702	21.1	11.9	175	15	24	91.4	86.3	110	11	16	90.0	85.5	240	43	65	82.1	72.9
5	M	959	676	716	29.5	25.3	263	17	22	93.5	91.6	260	15	18	94.2	93.1	480	48	53	90.0	89.0
6	T	965	710	739	26.4	23.4	250	12	21	95.2	91.6	260	15	16	94.2	93.8	540	59	55	89.1	89.8
7	W	975	771	813	20.9	16.6	241	23	36	90.5	85.1	260	18	25	93.1	90.4	500	68	84	86.4	83.2
8	Th	933	737	734	21.0	21.3	236	48	61	79.7	74.2	260	36	33	86.2	87.3	510	95	106	81.4	79.2
9	F	943	730	830	22.6	12.0	203	21	88	89.7	56.7	240	17	46	92.9	80.8	470	63	128	86.6	72.8
10	Sa	819	710	785	13.3	4.2	186	20	34	89.2	81.7	180	14	16	92.2	91.1	310	56	69	81.9	77.7
11	Su	707	666	713	5.6		139	13	18	90.6	87.1	120	11	15	90.8	87.5	260	48	54	81.5	79.2
12	M	980	726	765	25.9	21.9	325	29	30	91.1	90.8	250	12	14	95.2	94.4	510	40	44	92.2	91.4
13	T	956	710	717	25.7	25.0	238	13	23	94.5	90.3	260	10	23	96.2	91.2	530	60	71	88.7	86.6
14	W	1036	691	775	33.3	25.2	268	20	21	92.5	92.2	260	18	17	93.1	93.5	560	81	70	85.5	87.5
15	Th	1048	755	840	28.0	19.8	296	55	115	81.4	61.1	270	27	46	90.0	83.0	570	92	146	83.9	74.4
16	F	997	761	888	23.7	10.9	283	33	145	88.3	48.8	270	28	45	89.6	83.3	570	94	176	83.5	69.1
17	Sa	856	763	834	10.9	2.6	202	27	44	86.6	78.2	160	21	22	86.9	86.3	350	85	73	75.7	79.1
18	Su	721	656	684	9.0	5.1	163	14	36	91.4	77.9	130	10	22	92.3	83.1	260	46	63	82.3	75.8
19	M	966	760	656	21.3	32.1	263	12	18	95.4	93.2	310	13	15	95.8	95.2	510	53	51	89.6	90.0
20	T	964	730	743	24.3	22.9	268	33	33	87.7	87.7	270	19	16	93.0	94.1	540	78	67	85.6	87.6
21	W	1005	749	797	25.5	20.7	241	28	20	88.4	91.7	290	23	18	92.1	93.8	560	83	63	85.2	88.8
22	Th	1001	792	854	20.9	14.7	238	25	87	89.5	63.4	300	23	44	92.3	85.3	550	87	143	84.2	74.0
23	F	914	733	807	19.8	11.7	189	17	134	91.0	29.1	230	20	42	91.3	81.7	530	84	195	84.2	63.2
24	Sa	832	668	727	19.7	12.6	169	21	29	87.6	82.8	170	15	19	91.2	88.8	340	71	70	79.1	79.4
25	Su	706	642	684	9.1	3.1	128	20	39	84.4	69.5	120	14	22	88.3	81.7	260	62	92	76.2	64.6
26	M	1057	702	717	33.6	32.2	303	10	18	96.7	94.1	290	10	21	96.6	92.8	610	55	54	91.0	91.1
27	T	887	687	739	22.5	16.7	255	16	25	93.7	90.2	250	15	18	94.0	92.8	540	59	57	89.1	89.4
28	W	806	602	585	25.3	27.4	249	18	16	92.8	93.6	210	13	11	93.8	94.8	470	48	55	89.8	88.3
29	Th	1024	731	673	28.6	34.3	273	19	43	93.0	84.2	270	16	30	94.1	88.9	400	60	65	85.0	83.8
30	F	1008	808	821	19.8	18.6	276	33	40	88.0	85.5	270	22	20	91.9	92.6	420	74	80	82.4	81.0
31	Sa	824	596	718	27.7	12.9	189	23	40	87.8	78.8	140	14	19	90.0	86.4	310	44	68	85.8	78.1

PLANT OPERATIONAL DATA

NOVEMBER 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Su	757	699	721	7.7	4.8	113	12	14	89.4	87.6	110	15	9.0	86.4	91.8	250	53	55	78.8	78.0
2	M	914	620	714	32.2	21.9	193	10	16	94.8	91.7	190	8.6	14	95.5	92.6	400	32	47	92.0	88.3
3	T	823	627	636	23.8	22.7	150	6	8	96.0	94.7	190	14	15	92.6	92.1	420	46	64	89.0	84.8
4	W	965	700	679	27.5	29.6	219	18	20	91.8	90.9	230	14	13	93.9	94.3	480	49	48	89.8	90.0
5	Th	1006	795	802	21.0	20.3	209	32	22	84.7	89.5	260	17	12	93.5	95.4	550	53	59	90.4	89.3
6	F	1033	799	827	22.7	19.9	267	23	31	91.4	88.4	220	16	18	92.7	91.8	500	62	62	87.6	87.6
7	Sa	838	750	763	10.5	8.9	191	28	26	85.0	86.4	[illegible]	17	13	88.7	91.3	320	53	53	83.4	83.4
8	Su	767	744	687	3.0	10.4	151	15	18	90.0	88.1	100	13	11	87.0	89.0	220	38	45	82.7	79.5
9	M	902	693	763	23.2	15.4	265	15	18	94.3	93.2	220	11	14	95.0	93.6	450	45	54	90.0	88.0
10	T	1033	649	713	37.2	31.0	255	8	11	96.9	95.7	250	8.8	7.8	96.5	96.9	530	48	49	90.9	90.8
11	W	1043	835	835	19.9	19.9	179	8	8	95.5	95.5	270	10	6.0	96.3	97.8	510	57	61	88.8	88.0
12	Th	1010	787	757	22.1	25.0	192	8	9	95.8	95.3	270	12	11	95.6	95.9	520	57	63	89.0	87.9
13	F	1019	787	833	22.8	18.3	211	15	28	92.9	86.7	240	16	19	93.3	92.1	460	56	67	87.8	85.4
14	Sa	882	778	803	11.8	9.0	164	28	14	82.9	91.5	160	14	11	91.2	93.1	380	60	69	84.2	81.8
15	Su	790	715	731	9.5	7.5	155	24	18	84.5	88.4	130	16	11	87.7	91.5	270	60	64	77.8	76.3
16	M	985	687	785	30.3	20.3	210	15	7	92.9	96.7	260	12	11	95.4	95.8	500	58	62	88.4	87.6
17	T	1036	749	785	27.7	24.2	215	12	18	94.4	91.6	240	11	14	95.4	94.2	510	49	41	90.4	92.0
18	W	1040	860	813	17.3	21.8	211	9	24	95.7	88.6	240	11	18	95.4	92.5	550	60	71	89.1	87.1
19	Th	1020	867	902	15.0	11.6	282	70	68	75.2	75.9	260	26	42	90.0	83.8	550	100	107	81.8	80.5
20	F	892	623	790	30.2	11.4	184	17	113	90.8	38.6	240	13	54	94.6	77.5	450	59	146	86.9	67.6
21	Sa	907	778	797	14.2	12.1	228	14	39	93.9	82.9	240	8.0	16	96.7	93.3	420	49	78	88.3	81.4
22	Su	763	630	629	17.4	17.6	188	13	19	93.1	89.9	160	8.0	13	95.0	91.9	300	49	62	83.7	79.3
23	M	1060	712	778	32.8	26.6	270	19	32	93.0	88.1	260	16	21	93.8	91.9	530	55	61	89.6	88.5
24	T	1073	839	898	21.8	16.3	243	17	55	93.0	77.4	280	9.0		96.8		570	53	92	90.7	83.9
25	W	1046	842	843	19.5	19.4	211	34	18	83.9	91.5	260	22	11	91.5	95.8	560	85	61	84.8	89.1
26	Th	854	729	772	14.6	9.6	165	8	21	95.2	87.3	200	10	11	95.0	94.5	330	87	55	73.6	83.3
27	F	907	708	766	21.9	15.5	177	12	10	93.2	94.4	210	11	8.0	94.8	96.2	410	62	54	84.9	86.8
28	Sa	774	749	690	3.2	10.9	108	4	12	96.3	88.9	180	6.0	12	96.7	93.3	400	48	51	88.0	87.3
29	Su	685	681	737	0.6		121	12	16	90.1	86.8	100	6.0	11	94.0	89.0	230	39	54	83.0	76.5
30	M	1023	702	817	31.4	20.1	240	23	26	90.4	89.2	240	13	14	94.6	94.2	510	51	66	90.0	87.1
31																					

PLANT OPERATIONAL DATA

DECEMBER 1970

Date	Day	Total Solids					Suspended Solids					BOD					COD				
		mg/1			% Removal		mg/1			%Removal		mg/1			% Removal		mg/1			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	T	971	758	806	21.9	17.0	195	16	14	91.8	92.8	250	14	11	94.4	95.6	530	64	60	87.9	88.7
2	W	1083	859	862	20.7	20.4	282	24	23	91.5	91.8	260	12	14	95.4	94.6	570	67	70	88.2	87.7
3	Th	973	765	741	21.4	23.8	236	36	22	84.8	90.7	280	21	21	92.5	92.5	540	86	86	84.1	84.1
4	F	971	758	746	21.9	23.2	242	48	21	80.2	91.3	250	24	15	90.4	94.0	590	88	66	85.1	88.8
5	Sa	932	732	750	21.5	19.5	241	2	10	99.2	95.9	200	20	25	90.0	87.5	450	53	93	88.2	79.3
6	Su	727	653	688	10.2	5.4	144	10	12	93.1	91.7	120	7.0	12	94.2	90.0	270	47	49	82.6	81.9
7	M	1028	655	749	36.3	27.1	238	10	10	95.8	95.8	270	7.0	11	97.2	95.9	550	41	40	92.5	92.7
8	T	1051	821	788	21.9	25.0	277	18	28	93.5	89.9	280	13	37	95.4	86.8	610	62	75	89.8	87.7
9	W	1035	844	862	18.5	16.7	263	20	13	92.4	95.1	260	11	10	95.8	96.2	590	60	59	89.8	90.0
10	Th	1067	709	858	33.6	19.6	272	18	78	93.4	71.3		16	40				68	132		
11	F	1139	979	1108	14.0	2.7	234	93	178	60.3	23.9	220	38	61	82.7	72.3	430	135	209	68.6	51.4
12	Sa	943	909	930	3.6	1.4	166	22	37	86.7	77.7	130	10	15	92.3	88.5	310	63	93	79.7	70.0
13	Su	976	887	906	9.1	7.2	116	10	47	91.4	59.5	110	8.0	19	92.7	82.7	260	51	86	80.4	66.9
14	M	983	817	887	16.9	9.8	183	11	43	94.0	76.5	240	11	32	95.4	86.7	480	55	92	88.5	80.8
15	T	1085	806	815	25.7	24.9	237	18	17	92.4	92.8	250	13	10	94.8	96.0	520	66	43	87.3	91.7
16	W	1315	1020	1035	22.4	21.3	178	14	9	92.1	94.9	190	13	10	93.2	94.7	390	61	41	84.4	89.5
17	Th	1107	1019	1103	7.9		199	25	10	87.4	95.0	260	19	9.0	92.7	96.5	520	71	47	86.3	91.0
18	F	1054	947	919	10.2	12.8	216	20	47	90.7	78.2	220	14	22	93.6	90.0	470	65	102	86.2	78.3
19	Sa	947	845	891	10.8	5.9	175	19	46	89.1	73.7	150	9.0	34	94.0	77.3	350	57	55	83.7	84.3
20	Su	809	711	764	12.1	5.6	130	11	18	91.5	86.2	130	9.0	13	93.1	90.0	280	52	63	81.4	77.5
21	M	1078	859	836	20.3	22.4	205	12	14	94.1	93.2	210	6.0	14	97.1	93.8	480	51	77	89.4	84.0
22	T	1388	1003	1061	27.7	23.6	243	20	36	91.8	85.2	270	10	21	96.3	92.2	520	54	77	89.6	85.2
23	W	1125	1011	1027	10.1	8.7	206	7	40	96.6	80.6	260	10	18	96.2	93.1	510	57	93	88.8	81.8
24	Th	900	845	890	6.1	1.1	158	17	31	89.2	80.4	130	12	9.0	90.8	93.1	360	59	50	83.6	86.1
25	F	813	740	754	9.0	7.3	190	35	15	81.6	92.1	90	12	8.0	86.7	91.1	150	48	29	68.0	80.7
26	Sa	845	682	724	19.3	14.3	153	14	15	90.8	90.2	150	5.0	8.0	96.7	94.7	160	31	36	80.6	77.5
27	Su	863	748	703	13.3	18.5	145	18	20	87.6	86.2	100	8.0	9.0	92.0	91.0	140	38	47	72.9	66.4
28	M	1041	798	806	23.3	22.6	196	23	14	88.3	92.9	270	16	14	94.1	94.8	380	47	45	87.6	88.2
29	T	1113	812	889	27.0	20.1	248	19	15	92.3	94.0	280	14	15	95.0	94.6					
30	W	1144	803	884	29.8	22.7	261	5	5	98.1	98.1	330	12	10	96.4	97.0					
31	Th	1024	903	884	11.8	13.7	178	21	11	88.2	93.8	200	19	10	90.5	95.0	320	65	51	79.7	84.1

PLANT OPERATIONAL DATA JANUARY 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/1 as P			% Removal		mg/1 as P			% Removal		mg/1 as Fe			% Removal		mg/1 as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Th	6.5	0.63	1.5	90.3	76.9	3.0	0.29	1.3	90.3	56.7	6.01	0.46	0.59	92.4	90.5	1.04	0.25	0.30	76.0	71.2
2	F	9.2	0.97	2.2	89.5	76.1	3.8	0.71	1.9	81.3	50.0	7.31	0.49		93.4	69.7	0.71	0.27	0.18	62.4	75.2
3	Sa	9.0	0.64	2.0	92.9	77.8	4.3	0.46	1.7	89.3	60.5	6.72	0.50		92.6	62.4	0.61	0.44	0.34	28.7	45.1
4	Su	8.0	2.4	3.0	70.0	62.5	4.0	2.2	2.6	45.0	35.0	5.27	0.47	0.59	91.1	88.9	0.60	0.40	0.44	34.2	26.7
5	M	11.6	3.4	4.4	70.7	62.1	5.5	3.2	4.2	41.8	23.6	4.76	0.58	0.37	87.9	92.2	0.44	0.35	0.25	19.5	43.7
6	T	10.0	1.7	3.0	83.0	70.0	4.6	1.5	2.6	67.4	43.5	5.86	0.30	0.40	95.0	93.2	0.57	0.14	0.25	76.1	56.6
7	W	9.0	1.9	1.3	78.9	85.6	3.0	1.2	0.92	60.0	69.3	7.76	0.56	0.52	92.8	93.4	0.61	0.14	0.18	77.0	71.3
8	Th	9.4	1.8	1.2	80.9	87.2	3.1	1.2	0.52	61.3	83.3	10.10	0.73	0.96	92.8	90.5	0.89	0.11	0.22	87.6	75.1
9	F	9.9	1.3	2.4	86.9	75.8	3.4	0.66	0.25	80.6	92.6	9.06	0.72		92.1	55.7	0.34	0.09	0.12	75.0	66.2
10	Sa	10.1	0.57	0.61	94.4	94.0	3.4	0.33	0.20	90.3	94.1	9.73	0.31	0.92	96.8	90.5	0.22	0.23	0.15		30.2
11	Su	8.4	0.48	0.50	94.3	94.0	3.0	0.36	0.19	88.0	93.7	10.78	0.22	0.56	98.0	94.9	0.33	0.08	0.10	77.3	71.2
12	M	10.8	2.6	0.57	75.9	94.7	4.8	2.4	0.23	50.0	95.2	9.87	0.69	1.03	93.0	89.6	2.05	0.57	0.49	72.2	76.1
13	T	10.3	2.1	0.44	79.6	95.7						6.44	0.59	0.87	90.8	86.5					
14	W	9.5	2.7	0.40	71.6	95.8	3.8	2.7	0.16	28.9	95.8	7.79	0.30	0.70	96.1	91.0	1.22	0.28	0.50	77.0	59.0
15	Th	9.5	2.3	0.38	75.8	96.0	2.7	2.1	0.12	22.2	95.6	10.44	0.40	0.91	93.0	91.3	0.94	0.73	0.35	57.4	62.8
16	F	10.0	4.6	0.38	54.0	96.2	3.4	3.5	0.14		95.9	9.22	0.97	0.93	89.5	89.9	0.64	0.50	0.34	15.6	46.9
17	Sa	10.3	2.8	0.37	72.8	96.4	4.2	1.9	0.15	54.8	96.4	8.73	1.00	0.88	88.5	89.9	0.72	0.32	0.39	55.6	45.8
18	Su	8.2	1.0	0.80	87.8	90.2	3.6	0.56	0.60	84.4	83.3	6.49	0.75	0.76	88.4	88.3	0.65	0.30	0.41	53.8	36.9
19	M	10.7	3.5	1.6	67.3	85.0	4.8	2.9	1.4	39.6	70.8		0.96	1.16				0.38			
20	T	8.5	2.6	0.50	69.4	94.1	3.3	2.3	0.26	30.3	92.1		0.63					0.18			
21	W	9.5	3.3	0.50	65.3	94.7	3.8	2.8	0.16	26.3	95.8		0.53					0.35	0.56		
22	Th	9.0	2.2	0.35	75.6	96.1	3.2	1.9	0.17	40.6	94.7		0.24	0.89				0.11	0.45		
23	F	9.4	2.7	0.47	71.3	95.0	3.2	2.1	0.12	34.4	96.3		0.83					0.77	0.50		
24	Sa	10.0	2.4	0.51	76.0	94.9	5.2	2.0	0.21	61.5	96.0							0.38	0.53		
25	Su	8.8	2.1	0.85	76.1	90.3	4.3	1.8	0.59	58.1	86.3		0.88	0.99				0.06	0.85		
26	M	10.8	4.1	1.6	62.0	85.2	5.2	3.7	1.2	28.8	76.9										
27	T	10.2	4.8	0.65	52.9	93.6	3.5	4.5	0.34		90.3										
28	W	7.3	2.8	0.65	61.6	91.1	2.9	2.5	0.28	13.8	90.3										
29	Th	8.8	2.3	0.36	73.9	95.9	3.3	2.2	0.25	33.3	92.4										
30	F	11.8	3.1	0.63	73.7	94.7	4.5	2.6	0.21	42.2	95.3										
31	Sa	10.5	6.4	0.73	39.0	93.0	5.3	5.3	0.44		91.7										

PLANT OPERATIONAL DATA

FEBRUARY 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/1 as P			% Removal		mg/1 as P			% Removal		mg/1 as Fe			% Removal		mg/1 as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Su	6.3	3.8	1.9	39.7	69.8	3.4	3.3	1.5	2.9	55.9			.933							
2	M	11.4	3.6	1.9	68.4	83.3	5.8	3.3	1.6	43.1	72.4	4.52	.296	1.060	93.5	76.5	.268	.151	.141	43.7	47.4
3	T	9.5	2.8	0.83	70.5	91.3	4.8	2.7	0.50	43.8	89.6	4.72	.196	.980	95.8	79.2	.357	.097	.084	72.8	76.5
4	W	10.5	2.5	0.56	76.2	94.7	4.6	2.0	0.39	56.5	91.5	5.32	.297	.712	94.4	86.6	.234	.066	.124	71.8	47.0
5	Th	9.8	2.9	0.65	70.4	93.4	4.3	2.7	0.41	37.2	90.5	5.92	.268	.836	95.5	85.9	.331	.085	.062	74.3	81.3
6	F	11.6	2.7	0.89	76.7	92.3	4.2	2.3	0.51	45.2	87.9	5.40	.468	.706	91.3	86.9	.287	.181	.088	36.9	69.3
7	Sa	11.3	2.4	0.75	78.8	93.4	4.6	2.2	0.45	52.2	90.2	6.90	.457	.606	93.4	91.2	.185	.091	.080	50.8	56.8
8	Su	9.2	2.2	0.92	76.1	90.0	3.6	1.9	0.73	47.2	79.7	5.84		.491	98.9	91.6	.111	.087	.115	21.6	
9	M	11.8	3.8	1.5	67.8	87.3	4.3	2.8	1.1	34.9	74.4	7.96	.185	.691	97.7	91.3	.371	.043	.078	88.4	79.0
10	T	10.5	2.9	0.60	72.4	94.3	3.0	2.6	0.30	13.3	90.0	9.02	.332	.645	96.3	92.8	.333	.209	.079	37.2	76.2
11	W	10.2	1.9	0.61	81.4	94.0	4.3	1.7	0.31	60.5	92.8	5.68	.387	1.504	93.2	73.5	.427	.112	.162	73.8	62.1
12	Th	13.6	3.1	0.58	77.2	95.7	4.3	3.0	0.23	30.2	94.7	4.90	.263	1.494	94.6	69.5	.327		.527	99.9	
13	F	10.8	2.1	0.55	80.6	94.9	3.0	1.4	0.21	53.3	93.0	7.80	.397	1.076	94.9	86.2	.316	.131	.171	58.5	45.9
14	Sa	11.0	1.9	0.54	82.7	95.1	4.3	1.6	0.23	62.8	94.7	7.04	.263	1.270	96.3	82.0	.276	.093	.099	66.3	64.1
15	Su	9.3	2.0	0.96	78.5	89.7	4.2	1.9	0.72	54.8	82.9	4.20	.197	.486	95.3	88.4	.154	.055	.080	64.3	48.1
16	M	10.7	2.9	1.8	72.9	83.2	3.9	2.7	1.5	30.8	61.5			.487					.360		
17	T	9.8	2.1	0.71	78.6	92.8	3.2	1.7	0.44	46.9	86.3										
18	W	10.2	1.5	0.56	85.3	94.5	3.7	1.3	0.38	64.9	89.7	6.81	.209		96.9		.446	.106		76.2	
19	Th	10.0	2.1	0.47	79.0	95.3	3.3	1.5	0.17	54.5	94.8	8.78	.460	.777	94.8	91.2	.503	.129	.198	74.4	60.6
20	F	10.6	3.9	0.62	63.2	94.2	4.0	3.2	0.25	20.0	93.8	9.72	.553	1.009	94.3	89.6		.073	.440		
21	Sa	10.7	3.6	0.98	66.4	90.8	4.2	3.2	0.70	23.8	83.3	7.98	.397	.771	95.0	90.3	.314	.117	.054	62.7	82.8
22	Su	7.6	3.5	1.6	53.9	78.9	2.4	3.1	1.3		45.8	6.18	.325	.624	94.7	89.9	.179	.160	.065	10.6	63.7
23	M	11.0	3.0	1.3	72.7	88.2	4.1	2.8	1.0	31.7	75.6	8.06	.240	.631	97.0	92.2	.363	.145	.063	60.1	82.6
24	T	10.0	2.3	0.46	77.0	95.4	3.3	2.1	0.20	36.4	93.9	7.32	.199	.704	97.3	90.4	.394	.060	.054	84.8	86.3
25	W	11.1	1.1	0.38	90.1	96.6	3.6	0.95	0.19	73.6	94.7	8.44	.317	.654	96.2	92.3	.463	.076	.194	83.6	58.1
26	Th	9.8	0.86	0.47	91.2	95.2	1.9	0.73	0.17	61.6	91.1	11.36	.211	.676	98.1	94.0	.368	.114	.121	69.0	67.1
27	F	10.9	0.84	0.56	92.3	94.9	2.6	0.59	0.21	77.3	91.9	9.94		.863		91.3	.518	.139	.084	73.2	83.8
28	Sa	11.2	1.1	0.50	90.2	95.5	3.5	0.55	0.23	84.3	93.4	8.06	.299	.903	96.3	88.8	.520	.066	.368	87.3	29.2
29																					
30																					
31																					

PLANT OPERATIONAL DATA

MARCH 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/1 as P			% Removal		mg/1 as P			% Removal		mg/1 as Fe			% Removal		mg/1 as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Su	8.7	1.8	1.2	79.3	86.2	2.7	1.6	1.0	40.7	63.0	6.24	.333	.557	94.7	91.1	.297	.140	.253	52.9	14.8
2	M	10.2	3.3	1.4	67.6	86.3	3.7	3.2	1.1	13.5	70.3	8.02	.239	.811	97.0	89.9	.405	.251	.224	38.0	44.7
3	T	6.0	2.3	0.47	61.7	92.2	1.8	1.9	0.24		82.1	7.58	.379	.984	95.0	87.0	.399	.171	.154	57.1	61.4
4	W	8.9	1.3	0.65	85.4	92.7	3.0	0.97	0.20	67.7	93.3	8.04	1.000	1.102	87.6	86.3	.391	.144	.142	63.2	63.7
5	Th	10.3	2.0	0.43	80.6	95.8	3.6	1.8	0.27	50.0	92.5	7.78	.259	.884	96.7	88.6	.326	.149	.121	54.3	62.9
6	F	10.0	1.9	1.3	81.0	87.0	3.3	1.2	0.65	63.6	80.3	8.88	.724	2.455	91.8	73.0	.350	.197	.249	43.7	28.9
7	Sa	10.2	1.1	0.84	89.2	91.8	4.2	0.77	0.45	81.7	89.3	7.66	.461	.944	94.0	87.7	.363	.163	.126	55.1	65.3
8	Su	8.0	1.4	1.6	82.5	80.0	3.4	1.1	1.3	67.6	61.8	6.74	.422	.591	93.7	91.2	.204	.098	.105	52.0	48.5
9	M	9.8	2.8	1.3	71.4	86.7	3.2	2.7	1.1	15.6	65.6	10.26	.233	.294	97.7	97.1	.525	.075	.109	85.7	79.2
10	T	10.3	1.5	0.47	85.4	95.4	3.6	1.4	0.24	61.1	93.3	8.84	.283	.456	96.8	94.8	.372	.128	.096	65.6	74.2
11	W	9.4	1.8	0.30	80.9	96.8	3.4	1.6	0.22	52.9	93.5	8.14	.235	.262	97.1	96.8	.563	.113	.115	79.9	79.6
12	Th	9.8	1.8	0.26	81.6	97.3	3.6	1.7	0.13	52.8	96.4	7.74	.227	.253	97.1	96.7	.339	.142	.129	58.1	61.9
13	F	10.6	3.0	0.43	71.7	95.9	3.8	2.4	0.11	36.8	97.1	8.46	.478	.665	94.3	92.1	.487	.248	.111	49.1	77.2
14	Sa	11.1	2.2	0.55	80.2	95.0	4.2	1.9	0.25	54.8	94.0	8.32	.630	.601	92.4	92.8	.371	.402	.563		
15	Su	8.6	2.1	1.3	75.6	84.9	3.3	1.7	1.0	48.5	69.7	6.12	.306	.212	95.0	96.5	.253	.110	.118	56.5	53.4
16	M	11.3	3.9	1.5	65.5	86.7	4.4	3.8	1.3	13.6	70.5	8.08	.570	.507	92.9	93.7	.545	.284	.087	47.9	84.0
17	T	10.4	3.3	0.48	68.3	95.4	3.9	3.0	0.28	23.1	92.8	8.00	.339	.493	95.8	93.8	.532	.212	.089	60.2	83.3
18	W	10.6	2.3	0.53	78.3	95.0	4.2	2.1	0.25	50.0	94.0	8.36	.274	.574	96.7	93.1	.557	.112	.132	79.9	76.3
19	Th	8.9	2.0	0.47	77.5	94.7	3.5	1.7	0.31	51.4	91.1	8.50	.309	.481	96.4	94.3	.511	.160	.117	68.7	77.1
20	F	8.3	1.4	0.41	83.1	95.1	3.5	1.1	0.35	68.6	90.0	7.22	.258	.674	96.4	90.7	.449	.196	.563	56.3	
21	Sa	10.4	2.2	0.57	78.8	94.5	5.0	1.7	0.45	66.0	91.0	7.58	.436	.565	94.2	92.5	.385	.141	.108	63.4	71.9
22	Su	8.8	2.9	1.7	67.0	80.7	4.8	2.4	1.6	50.0	66.7	6.06	.423	.558	93.0	90.8	.224	.184	.085	17.9	62.1
23	M	11.6	4.1	1.6	64.7	86.2	4.9	4.0	1.3	18.4	73.5	8.44	.239	.763	97.2	91.0	.224	.147	.106	34.4	52.7
24	T	9.9	3.9	0.49	60.6	95.1	3.6	3.5	0.24	2.8	93.3	8.94	.268	.742	97.0	91.7	.381	.119	.085	68.8	77.7
25	W	10.0	1.5	0.51	85.0	94.9	3.0	1.4	0.18	53.3	94.0	10.88	.410	.850	96.2	92.2	.421	.190	.191	54.9	54.6
26	Th	8.4	1.3	0.47	84.5	94.4	2.8	1.0	0.15	64.3	94.6	8.70	.309	.708	96.4	91.9	.460	.193	.085	58.0	81.5
27	F	9.6	1.2	0.93	87.5	90.3	3.2	0.74	0.21	76.9	93.4	7.22	.497	1.913	93.1	73.5	.333	.175	.110	47.4	67.0
28	Sa	8.8	0.90	0.84	89.8	90.5	3.5	0.54	0.47	84.6	86.6	5.82	.433	.775	92.6	86.7	.303	.196	.080	35.3	73.6
29	Su	6.7	2.2	1.6	67.2	76.1	2.7	1.8	1.3	33.3	51.9	4.68	.353	.574	92.5	87.7	.275	.121	.109	56.0	60.4
30	M	10.9	3.1	1.6	71.6	87.7	4.9	2.7	1.2	44.9	75.5	6.42	.439	.929	93.2	85.5	.443	.096	.102	78.3	77.0
31	T	9.7	2.9	0.51	70.1	94.7	4.6	2.3	0.30	50.0	93.5	5.62	.395	.545	93.0	90.3	.439	.178	.306	59.5	30.3

PLANT OPERATIONAL DATA APRIL 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/1 as P			% Removal		mg/1 as P			% Removal		mg/1 as Fe			% Removal		mg/1 as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	W	9.0	2.4	0.46	73.3	94.9	4.2	1.9	0.16	54.8	96.2	6.90	0.44	0.67	93.6	90.3	0.45	0.27	0.36	40.0	20.0
2	Th	7.6	1.3	0.37	82.9	95.1	3.0	1.1	0.11	63.3	96.3	6.74	0.37	0.84	94.5	87.5	0.39	0.20	0.18	48.7	53.8
3	F	8.2	1.8	0.27	78.0	96.7	3.4	1.3	0.11	61.8	96.8	6.30	0.61	0.63	90.3	90.0	0.37	0.20	0.17	45.9	54.1
4	Sa	8.4	1.4	0.28	83.3	96.7	4.2	0.86	0.19	79.5	95.5	5.66	0.62	0.45	89.0	92.0	0.38	0.20	0.15	47.4	60.5
5	Su	6.8	1.8	1.2	73.5	82.4	3.5	1.7	1.0	51.4	71.4	4.36	0.20	0.17	95.4	96.1	0.31	0.16	0.15	48.4	51.6
6	M	9.9	3.5	1.5	64.6	84.8	5.2	3.1	1.3	40.4	75.0	5.70	0.81	0.69	85.8	87.9	0.40	0.13	0.15	67.5	62.5
7	T	9.1	3.7	0.43	59.3	95.3	4.4	3.5	0.38	20.5	91.4	6.16	0.31	0.15	95.0	97.6	0.90	0.30	0.11	66.7	87.8
8	W	9.1	1.9	0.26	79.1	97.1	2.9	1.7	0.17	41.4	94.1	11.16	0.50	0.29	95.5	97.4	1.11	0.31	0.15	72.1	86.5
9	Th	9.2	1.6	0.18	82.6	98.0	4.0	1.3	0.17	67.5	95.8	7.66	0.43	0.25	94.4	96.7	0.50	0.33	0.18	34.0	64.0
10	F	9.3	2.0	0.22	78.5	97.6	3.5	1.8	0.18	48.6	94.9	10.94	0.54	0.27	95.1	97.5	0.60	0.27	0.22	55.0	63.3
11	Sa	8.7	1.8	0.22	79.3	97.5	4.3	1.1	0.19	74.4	95.6	6.12	0.63	0.56	89.7	90.8	0.60	0.35	0.16	41.7	73.3
12	Su	7.8	1.7	0.88	78.2	88.7	4.4	1.6	0.82	63.6	81.4	3.40	0.26	0.30	92.4	91.2	0.35	0.19	0.21	45.7	40.0
13	M	6.8	2.4	1.3	64.7	80.9	3.1	2.1	1.2	32.3	61.3	6.22	0.33	0.22	94.7	96.5	0.47	0.18	0.17	61.7	63.8
14	T	7.6	1.5	0.35	80.3	95.4	3.5	1.4	0.29	60.0	91.7	7.02	0.33	0.22	95.3	96.9	0.49	0.28	0.19	42.9	61.2
15	W	8.2	1.2	0.28	85.4	96.6	3.8	1.1	0.22	71.1	94.2	6.50	0.31	0.22	95.2	96.6	0.48	0.25	0.16	47.9	66.7
16	Th	8.4	1.8	0.29	78.6	96.5	4.0	1.7	0.20	57.5	95.0	6.72	0.27	0.35	96.0	94.8	0.41	0.18	0.13	56.1	68.3
17	F	9.7	2.5	0.28	74.2	97.1	3.9	1.8	0.19	53.8	95.1	8.76	0.84	0.36	90.4	95.9	0.61	0.33	0.15	45.9	75.4
18	Sa	10.6	1.8	0.29	83.0	97.3	2.6	1.3	0.19	50.0	92.7	18.64	0.64	0.40	96.6	97.9	0.90	0.21	0.15	76.7	83.3
19	Su	6.1	1.0	0.43	83.6	93.0	2.7	0.43	0.33	84.1	87.8	6.94	0.80	0.47	88.5	93.2	0.43	0.20	0.14	53.5	67.4
20	M	8.8	1.2	0.48	86.4	94.5	3.9	0.99	0.35	74.6	91.0	8.06	0.73	0.45	90.9	94.4	0.73	0.35	0.45	52.1	38.4
21	T	8.7	1.1	0.35	87.4	96.0	3.9	0.87	0.18	77.7	95.4	7.50	0.49	0.60	93.5	92.0	0.55	0.27	0.15	50.9	72.7
22	W	8.1	0.80	0.33	90.1	95.9	4.0	0.72	0.19	82.0	95.3	6.68	0.21	0.38	96.9	94.3	0.46	0.17	0.16	63.0	65.2
23	Th	8.1	0.57	0.28	93.0	96.5	2.8	0.50	0.18	82.1	93.6	8.16	0.26	0.56	96.8	93.1	0.49	0.21	0.16	57.1	67.3
24	F	7.3	1.1	0.16	84.9	97.8	3.3	0.71	0.11	78.5	96.7	6.46	0.35	0.43	94.6	93.3	0.46	0.17	0.22	63.0	52.2
25	Sa	7.8	0.55	0.27	92.9	96.5	3.6	0.43	0.10	88.1	97.2	6.44	0.29	0.54	95.5	91.6	0.45	0.29	0.21	35.6	53.3
26	Su	6.4	0.34	0.39	94.7	93.9	3.2	0.26	0.26	91.9	91.9	5.14	0.41	0.81	92.0	84.2	0.40	0.19	0.50	52.5	
27	M	9.8	0.35	0.44	96.4	95.5	4.7	0.27	0.33	94.3	93.0	6.40	0.13	0.41	98.0	93.6	0.33	0.08	0.13	75.8	60.6
28	T	8.2	1.8	0.80	78.0	90.2	3.0	0.65	0.28	78.3	90.7	8.34	1.51	1.22	81.9	85.4	0.57	0.12	0.13	78.9	77.2
29	W	8.3	1.1	0.67	86.7	91.9	3.5	0.70	0.34	80.0	90.3	6.40	0.43	0.97	93.3	84.8	0.38	0.10	0.08	73.7	78.9
30	Th	6.7	1.4	1.8	79.1	73.1	2.8	1.3	0.36	53.6	87.1	6.24	0.39	4.20	93.8	32.7	0.56	0.21	0.54	62.5	3.6
31																					

PLANT OPERATIONAL DATA

MAY 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/l as P			% Removal		mg/l as P			% Removal		mg/l as Fe			% Removal		mg/l as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	F	7.9	1.1	2.5	86.1	68.4	2.5	0.66	0.24	73.6	90.4	7.44	0.38	6.30	94.9	15.3	0.71	0.21	0.24	70.4	66.2
2	Sa	8.0	0.43	0.67	94.6	91.6	3.1	0.25	0.31	91.9	90.0	6.88	0.26	1.14	96.2	83.4	0.43	0.16	0.22	62.8	48.8
3	Su	6.9	0.33	0.59	95.2	91.4	2.8	0.19	0.36	93.2	87.1	4.78	0.19	0.55	96.0	88.5	0.37	0.17	0.19	54.1	48.6
4	M	9.4	0.40	0.63	95.7	93.3	3.8	0.32	0.23	91.6	93.9	7.84	0.17	1.22	97.8	84.4	0.33	0.08	0.09	75.8	72.7
5	T	8.9	1.1	0.35	87.6	96.1	3.3	0.87	0.21	73.6	93.6	8.72	0.27	0.56	96.9	93.6	0.44	0.22	0.30	50.0	31.8
6	W	8.8	1.6	0.34	81.8	96.1	3.5	1.4	0.19	60.0	94.6	9.86	0.35	0.46	96.5	95.3	0.49	0.22	0.17	55.1	65.3
7	Th	8.8	2.4	0.48	72.7	94.5	2.5	1.6	0.27	36.0	89.2	9.88	0.97	0.82	90.2	91.7	0.57	0.21	0.09	63.2	84.2
8	F	8.3	4.7	0.73	43.4	91.2	3.1	1.4	0.32	54.8	89.7	8.84	2.67	1.25	69.8	85.9	0.44	0.31	0.16	29.5	63.6
9	Sa	8.4	1.3	0.43	84.5	94.9	3.0	0.63	0.28	79.0	90.7	7.62	0.69	0.43	90.9	94.4	0.38	0.13	0.08	65.8	78.9
10	Su	5.9	0.54	0.32	90.8	94.6	2.3	0.28	0.19	87.8	91.7	6.90	0.29	0.43	95.8	93.8	0.35	0.12	0.11	65.7	68.6
11	M	8.0	0.51	0.32	93.6	96.0	3.5	0.33	0.14	90.6	96.0	9.16	0.18	0.57	98.0	93.8	0.51	0.11	0.06	78.4	88.2
12	T	5.5	0.44	0.21	92.0	96.2	2.3	0.28	0.11	87.8	95.2	7.62	0.23	0.45	97.0	94.1	0.42	0.10	0.18	76.2	57.1
13	W	4.9	0.34	0.20	93.1	95.9	2.0	0.23	0.09	88.5	95.5	6.20	0.20	0.45	96.8	92.7	0.41	0.18	0.16	56.1	61.0
14	Th	5.4	0.23	0.28	95.7	94.8	2.4	0.19	0.09	92.1	96.3	5.28	0.17	0.87	96.8	83.5	0.39	0.11	0.03	71.8	92.3
15	F	5.0	0.56	0.23	88.8	95.4	2.0	0.17	0.13	91.5	93.5	5.44	0.61	0.42	88.8	92.3	0.33	0.22	0.10	33.3	69.7
16	Sa	5.8	0.55	0.23	90.5	96.0	2.6	0.27	0.17	89.6	93.5	4.84	0.40	1.11	91.7	77.1	0.18	0.06	0.06	66.7	66.7
17	Su	5.4	0.84	0.21	84.4	96.1	2.8	0.27	0.18	90.4	93.6	4.00	0.97	0.20	75.8	95.0	0.22	0.13	0.10	40.9	54.5
18	M	8.5	1.3	0.45	84.7	94.7	3.7	1.1	0.36	70.3	90.3	4.34	0.35	0.45	91.9	89.6	0.39	0.13	0.32	66.7	17.9
19	T	7.8	1.6	0.29	79.5	96.3	2.4	1.4	0.18	41.7	92.5	9.14	0.64	0.67	93.0	92.7	0.73	0.45	0.36	38.4	50.7
20	W	7.9	1.4	0.21	82.3	97.3	2.5	0.85	0.13	66.0	94.8	8.94	0.86	0.69	90.4	92.3	0.83	0.43	0.35	48.2	57.8
21	Th	7.5	1.3	0.24	82.7	96.8	3.1	0.65	0.14	79.0	95.5	6.42	0.93	1.58	85.5	75.4	0.98	0.29	0.33	70.4	66.3
22	F	8.4	1.3	0.37	84.5	95.6	3.3	0.64	0.14	80.6	95.8	7.18	0.92	1.05	87.2	85.4	0.75	0.38	0.24	49.3	68.0
23	Sa	6.7	0.38	0.28	94.3	95.8	3.0	0.22	0.14	92.7	95.3	5.58	0.42	0.63	92.5	88.7	0.58	0.39	0.25	32.8	56.9
24	Su	6.4	0.34	0.36	94.7	94.4	2.4	0.16	0.18	93.3	92.5	6.44	0.58	0.90	91.0	86.0	0.49	0.33	0.31	32.7	36.7
25	M	8.0	0.45	1.1	94.4	86.3	3.2	0.30	0.24	90.6	92.5	6.96	0.41	2.81	94.1	59.6	0.54	0.32	0.34	40.7	37.0
26	T	8.2	0.44	0.93	94.6	88.7	3.4	0.29	0.50	91.5	85.3	6.72	0.49	1.27	92.7	81.1	0.53	0.33	0.41	37.7	22.6
27	W	8.0	0.61	0.38	92.4	95.3	3.1	0.36	0.31	88.4	90.0	7.52	0.57	0.71	92.4	90.6	0.70	0.31	0.36	55.7	48.6
28	Th	7.7	3.4	0.30	55.8	96.1	2.5	0.82	0.15	67.2	94.0	8.40	2.20	0.96	73.8	88.6	0.65	0.43	0.33	33.8	49.2
29	F	7.7	3.8	0.31	50.6	96.0	2.9	0.42	0.13	85.5	95.5	5.82	2.85	0.94	51.0	83.8	0.63	0.34	0.31	46.0	50.8
30	Sa	6.8	0.43	0.41	93.7	94.0	2.4	0.23	0.16	90.4	93.3	5.24	0.47	1.17	91.0	78.2	0.49	0.23	0.20	53.1	59.2
31	Su	5.3	0.65	0.82	87.7	84.5	2.0	0.27	0.45	86.5	77.5	5.42	0.55	1.11	89.9	79.5	0.36	0.36	0.42		

PLANT OPERATIONAL DATA JUNE 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/l as P			% Removal		mg/l as P			% Removal		mg/l as Fe			% Removal		mg/l as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	M	5.5	1.4	1.7	74.5	69.1	2.5	1.3	1.0	48.0	60.0	4.80	0.45	3.54	90.6	26.3	0.54	0.40	0.31	25.9	42.6
2	T	3.9	0.93	0.61	76.2	84.4	1.3	0.74	0.23	43.1	82.3	5.68	0.39	1.71	93.1	69.9	1.07	0.21	0.36	80.4	66.4
3	W	5.5	0.38	0.28	93.1	94.9	1.6	0.21	0.11	86.9	93.1	7.86	0.60	0.85	92.4	89.2	0.58	0.36	0.36	37.9	37.9
4	Th	6.0	0.37	0.20	93.8	96.7	2.4	0.22	0.11	90.8	95.4	5.72	0.81	1.11	85.8	80.6	0.75	0.63	0.24	16.0	68.0
5	F	6.6	0.59	0.25	91.1	96.2	2.2	0.28	0.10	87.3	95.5	5.24	0.47	0.89	91.0	83.0	0.66	0.36	0.55	45.5	16.7
6	Sa	6.1	0.52	0.30	91.5	95.1	2.6	0.22	0.12	91.5	95.4	4.30	0.74	0.92	82.8	78.6	0.67	0.63	0.46	6.0	31.3
7	Su	5.4	0.41	0.25	92.4	95.4	2.6	0.21	0.16	91.9	93.8	4.44	0.42	0.81	90.5	81.8	0.51	0.36	0.40	29.4	21.6
8	M	7.8	1.3	1.1	83.3	85.9	4.0	1.1	0.37	72.5	90.8	4.30	0.46	2.62	89.3	39.1	0.39	0.24	0.27	38.5	30.8
9	T	7.8	1.4	0.46	82.1	94.1	3.4	1.1	0.34	67.6	90.0	4.00	0.33	0.63	91.8	84.3	0.52	0.22	0.24	57.7	53.8
10	W	7.1	2.1	0.31	70.4	95.6	3.1	1.9	0.22	38.7	92.9	5.14	0.31	0.60	94.0	88.3	0.45	0.23	0.11	48.9	75.6
11	Th	7.0	1.2	2.7	82.9	61.4	2.7	0.88	0.28	67.4	89.6	5.50	0.49	5.92	91.1		0.40	0.09	0.17	77.5	57.5
12	F	7.0	1.8	1.9	74.3	72.9						6.06	0.63	4.26	89.6	29.7					
13	Sa	6.4	0.84	1.5	86.9	76.6						5.62	0.22	3.33	96.1	40.7					
14	Su	5.3	0.39	0.73	92.6	86.2	2.4	0.24	0.14	90.0	94.2	4.30	0.27	0.73	93.7	83.0	0.35	0.20	0.24	42.9	31.4
15	M	7.7	1.6	0.47	79.2	93.9	3.2	1.5	0.13	53.1	95.9	5.88	0.49	0.79	91.7	86.6	0.78	0.33	0.29	57.7	62.8
16	T	7.6	2.9	0.43	61.8	94.3	3.1	2.8	0.25	9.7	91.9	5.12	0.29	0.58	94.3	88.7	0.51	0.19	0.14	62.7	72.5
17	W	6.8	1.8	1.3	73.5	80.9	2.6	1.7	0.30	34.6	88.5	5.20	0.52	2.06	90.0	60.4	0.53	0.26	0.13	50.9	75.5
18	Th	6.7	1.1	2.3	83.6	65.7	2.4	0.72	0.47	70.0	80.4	5.56	0.51	4.98	90.8	10.4	0.70	0.27	0.24	61.4	65.7
19	F	7.6	1.9	1.7	75.0	77.6	2.0	0.79	0.14	60.5	93.0	7.34	0.88	3.29	88.0	55.2	0.41	0.26	0.13	36.6	68.3
20	Sa	7.0	0.58	0.48	91.7	93.1	2.3	0.22	0.19	90.4	91.7	5.76	0.67	0.99	88.4	82.8	0.48	0.24	0.13	50.0	72.9
21	Su	5.6	0.37	0.37	93.4	93.4	2.1	0.25	0.17	88.1	91.9	4.66	0.39	0.87	91.6	81.3	0.57	0.30	0.23	47.3	59.6
22	M	8.4	1.3	0.71	84.5	91.5	4.1	1.2	0.26	70.7	93.7	4.80	0.31	0.70	93.5	85.4	0.60	0.28	0.20	53.3	66.7
23	T	7.5	1.9	0.64	74.7	91.5	2.9	1.8	0.24	37.9	91.7	6.48	0.86	1.58	86.7	75.6	1.23	0.71	0.63	42.3	48.8
24	W	7.9	1.1	1.8	86.1	77.2	3.1	0.98	0.25	68.4	91.9	6.86	0.77	4.40	88.8	35.9	1.72	0.62	0.89	64.0	48.3
25	Th	7.0	0.93	0.60	86.7	91.4	2.8	0.68	0.16	75.7	94.3	11.02	1.02	1.56	90.7	85.8	1.26	0.77	0.76	38.9	39.7
26	F	5.8	0.53	4.1	90.9	29.3	2.2	0.51	0.17	76.8	92.3	6.88	0.99	8.22	85.6		1.10	0.72	0.72	34.5	34.5
27	Sa	7.2	0.38	0.52	94.7	92.8	2.6	0.26	0.14	90.0	94.6	7.52	0.82	1.42	89.1	81.1	1.07	0.46	0.87	57.0	18.7
28	Su	5.8	0.64	0.38	89.0	93.4	2.0	0.45	0.14	77.5	93.0	7.28	0.93	1.83	87.2	74.9	0.93	0.49	0.87	47.3	6.5
29	M	8.6	1.9	0.41	77.9	95.2	3.1	1.9	0.22	38.7	92.9	7.84	0.62	1.07	92.1	86.4	0.94	0.53	0.59	43.6	37.2
30	T	7.3	1.5	0.34	79.5	95.3	2.6	1.4	0.15	46.2	94.2	7.22	0.73	1.53	89.9	78.8	1.32	0.62	1.06	53.0	19.7
31																					

PLANT OPERATIONAL DATA JULY 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/l as P			% Removal		mg/l as P			% Removal		mg/l as Fe			% Removal		mg/l as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	W	8.0	0.95	0.45	88.1	94.4	2.6	0.85	0.17	67.3	93.5	7.44	0.83	1.62	88.8	78.2	1.29	0.78	0.66	39.5	48.8
2	Th	7.5	0.66	0.36	91.2	95.2	2.8	0.52	0.16	81.4	94.3	8.12	0.57	1.15	93.0	85.8	1.13	0.44	0.60	61.1	46.9
3	F	7.9	0.83	0.19	89.5	97.9	2.1	0.71	0.11	66.2	94.8	8.92	1.06	0.87	88.1	90.2	1.72	0.75	0.53	56.4	69.2
4	Sa	6.7	0.31	0.31	95.4	95.4	1.9	0.22	0.11	88.4	94.2	6.80	0.84	0.99	87.6	85.4	1.14	0.70	0.59	38.6	48.2
5	Su	6.7	0.34	0.45	94.9	93.3	2.1	0.26	0.16	87.6	92.4	7.94	0.89	1.17	88.8	85.3	0.91	0.68	0.76	25.3	16.5
6	M	9.6	1.1	0.80	88.5	91.7	6.0	1.0	0.54	83.3	91.0	4.84	1.02	1.27	78.9	73.8	1.04	0.80	0.72	23.1	30.8
7	T	7.7	1.2	0.96	84.4	87.5	4.8	0.79	0.58	83.5	87.9	3.94	0.88	1.53	77.7	61.2	0.96	0.57	0.51	40.6	46.9
8	W	7.8	1.3	4.5	83.3	42.3	3.5	1.0	0.49	71.4	86.0	6.40	0.98	9.16	84.7		1.22	0.75	1.08	38.5	11.5
9	Th	7.8	2.9	3.3	62.8	57.7	2.4	1.5	0.21	37.5	91.3	9.86	1.96	6.73	80.1	31.7	1.23	0.90	0.75	26.8	39.0
10	F	7.6	3.7	1.6	51.3	78.9	1.6	0.57	0.21	64.4	86.9	10.52	3.36	4.30	68.1	59.1	1.40	0.95	0.90	32.1	35.7
11	Sa	7.2	1.7	0.75	76.4	89.6	1.8	0.21	0.21	88.3	88.3	7.98	1.81	1.88	77.3	76.4	0.94	0.67	0.83	28.7	11.7
12	Su	5.9	0.50	1.3	91.5	78.0	1.7	0.20	0.21	88.2	87.6	7.76	1.16	3.40	85.1	56.2	1.32	0.97	0.97	26.5	26.5
13	M	7.7	0.51	1.5	93.4	80.4	3.7	0.17	0.38	95.4	89.7	6.00	0.42	2.15	93.0	64.2	0.45	0.13	0.31	71.1	31.1
14	T	6.3	0.56	0.77	91.1	87.8	2.9	0.15	0.18	94.8	93.8	4.76	0.38	1.67	92.0	64.9	0.32	0.08	0.22	75.0	31.3
15	W	7.0	0.60	0.35	91.4	95.0	2.5	0.21	0.11	91.6	95.6	5.84	0.35	0.71	94.0	87.8	0.55	0.17	0.06	69.1	89.1
16	Th	7.0	0.60	0.19	91.4	97.3	1.8	0.30	0.10	83.3	94.4	7.46	0.47	0.38	93.7	94.9	0.49	0.06	0.16	87.8	67.3
17	F	6.6	2.7	0.23	59.1	96.5	1.9	0.58	0.10	69.5	94.7	6.16	1.95	0.60	68.3	90.3	0.42	0.07	0.25	83.3	40.5
18	Sa	6.1	0.63	0.19	89.7	96.9	1.6	0.21	0.10	86.9	93.8	6.46	0.32	0.34	95.0	94.7	0.30	0.21	0.07	30.0	76.7
19	Su	5.1	0.51	0.20	90.0	96.1	1.6	0.15	0.11	90.6	93.1	6.16	0.22	0.20	96.4	96.8	0.25	0.06	0.08	76.0	68.0
20	M	8.7	0.62	0.40	92.9	95.4	4.0	0.24	0.27	94.0	93.3	5.06	0.36	0.21	92.9	95.8	0.58	0.09	0.06	34.5	89.7
21	T	8.2	0.47	0.20	94.3	97.6	3.7	0.21	0.17	94.3	95.4	5.80	0.37	0.22	93.6	96.2	0.40	0.11	0.03	72.5	92.5
22	W	8.0	0.54	0.19	93.3	97.6	3.5	0.24	0.14	93.1	96.0	5.44	0.25	0.26	95.4	95.2	0.35	0.08	0.19	77.1	45.7
23	Th	7.5	0.89	0.20	88.1	97.3	2.8	0.34	0.14	87.9	95.0	6.76	0.38	0.38	94.4	94.4	0.32	0.04	0.09	87.5	71.9
24	F	7.4	0.87	0.34	88.2	95.4	1.8	0.36	0.14	80.0	92.2	8.80	0.35	0.63	96.0	92.8	0.54	0.07	0.07	87.0	87.0
25	Sa	6.6	0.54	0.34	91.8	94.8	1.7	0.21	0.14	87.6	91.8	6.88	0.24	0.59	96.5	91.4	0.25	0.06	0.05	76.0	80.0
26	Su	5.4	0.49	0.29	90.9	94.6	1.4	0.20	0.11	85.7	92.1	6.16	0.27	0.41	95.6	93.3	0.21	0.03	0.06	85.7	71.4
27	M	7.3	0.69	0.24	90.5	96.7	2.5	0.58	0.13	76.8	94.8	8.08	0.61	0.69	92.5	91.5	0.90	0.34	0.52	62.2	42.2
28	T	7.1	0.52	0.25	92.7	96.5	2.1	0.40	0.13	81.0	93.8	7.76	0.65	0.71	91.6	90.9	0.95	0.25	0.57	73.7	40.0
29	W	7.2	0.82	0.26	88.6	96.4	2.5	0.72	0.13	71.2	94.8	7.36	0.62	0.67	91.6	90.9	1.13	0.34	0.49	69.9	56.6
30	Th	6.5	1.1	0.24	83.1	96.3	1.2	0.67	0.12	44.2	90.0	9.48	0.79	0.86	91.7	90.9	0.73	0.31	0.52	57.5	28.8
31	F	6.1	0.91	0.31	85.1	94.9	2.0	0.43	0.11	78.5	94.5	7.34	0.85	1.05	88.4	85.7	0.52	0.22	0.24	57.7	53.8

PLANT OPERATIONAL DATA AUGUST 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/1 as P			% Removal		mg/1 as P			% Removal		mg/1 as Fe			% Removal		mg/1 as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Sa	6.5	0.54	0.29	91.7	95.5	2.1	0.19	0.26	91.0	87.6	7.20	1.12	1.10	84.4	84.7	0.63	0.37	0.32	41.3	49.2
2	Su	5.0	0.50	0.17	90.0	96.6	1.8	0.19	0.10	89.4	94.4	7.10	0.52	0.52	92.7	92.7	0.49	0.31	0.27	36.7	44.9
3	M	8.3	0.93	0.24	88.8	97.1	3.5	0.38	0.14	89.1	96.0	6.08	0.63	0.68	89.6	88.8	0.84	0.48	0.36	42.9	57.1
4	T	7.4	0.46	0.21	93.8	97.2	2.8	0.26	0.13	90.7	95.4	6.44	0.54	0.52	91.6	91.9	0.83	0.35	0.43	57.8	48.2
5	W	7.3	0.55	0.28	92.5	96.2	2.8	0.31	0.13	88.9	95.4	6.56	0.73	0.81	88.9	87.7	1.17	0.33	0.33	71.8	71.8
6	Th	7.2	0.62	0.21	91.4	97.1	2.6	0.34	0.12	86.9	95.4	7.00	0.53	0.82	92.4	88.3	1.03	0.25	0.30	75.7	70.9
7	F	8.1	0.45	0.25	94.4	96.9	3.5	0.29	0.12	91.7	96.6	6.48	0.48	0.63	92.6	90.3	0.86	0.21	0.22	75.6	74.4
8	Sa	7.9	0.52	0.22	93.4	97.2	2.8	0.36	0.08	87.1	97.1	7.38	0.42	0.60	94.3	91.9	0.67	0.29	0.28	56.7	58.2
9	Su	6.6	0.44	0.22	93.3	96.7	2.5	0.25	0.11	90.0	95.6	6.96	0.39	0.36	94.4	94.8	0.41	0.15	0.24	63.4	41.5
10	M	8.4	0.56	0.28	93.3	96.7	3.6	0.33	0.16	90.8	95.6	6.84	0.47	0.80	93.1	88.3	1.38	0.39	0.29	71.7	79.0
11	T	7.0	0.61	0.25	91.3	96.4	2.2	0.31	0.09	85.9	95.9	6.92	0.51	0.56	92.6	91.9	0.78	0.35	0.40	55.1	48.7
12	W	7.0	0.67	0.29	90.4	95.9	2.0	0.39	0.11	80.5	94.5	7.00	0.40	0.49	94.3	93.0	1.25	0.27	0.24	78.4	80.8
13	Th	7.7	0.79	0.27	89.7	96.5	2.9	0.44	0.11	84.8	96.2	6.66	0.48	0.63	92.8	90.5	1.16	0.23	0.17	80.2	85.3
14	F	7.2	0.88	0.23	87.8	96.8	2.5	0.53	0.10	78.8	96.0	8.28	0.53	0.65	93.6	92.1	0.98	0.18	0.20	81.6	79.6
15	Sa	5.6	0.54	0.15	90.4	97.3	2.4	0.33	0.10	86.3	95.8	5.56	0.93	0.34	83.3	93.9	0.46	0.12	0.23	73.9	50.0
16	Su	6.2	0.49	0.23	92.1	96.3	2.1	0.20	0.13	90.5	93.8	6.38	0.50	0.49	92.2	92.3	0.83	0.33	0.20	60.2	75.9
17	M	8.5	0.56	0.49	93.4	94.2	3.4	0.26	0.26	92.4	92.4	6.86	0.62	0.77	91.0	88.8	1.18	0.32	0.43	72.9	63.6
18	T	6.4	0.55	0.30	91.4	95.3	1.8	0.22	0.12	87.8	93.3	7.90	0.59	0.75	92.5	90.5	1.34	0.43	0.37	67.9	72.4
19	W	7.0	0.57	0.28	91.9	96.0	2.2	0.20	0.09	90.9	95.9	7.96	0.64	0.64	92.0	92.0	1.09	0.29	0.37	73.4	66.1
20	Th	7.8	0.74	0.23	90.5	97.1	2.6	0.35	0.13	86.5	95.0	8.14	0.65	0.79	92.0	90.3	1.06	0.40	0.27	62.3	74.5
21	F	7.9	1.1	0.25	86.1	96.8	2.4	0.30	0.13	87.5	94.6	8.50	0.70	0.88	91.8	89.6	0.72	0.28	0.42	61.1	41.7
22	Sa	7.3	0.48	0.27	93.4	96.3	3.3	0.25	0.13	92.4	96.1	7.86	0.53	0.93	93.3	88.2	1.14	0.37	0.45	67.5	60.5
23	Su	6.5	0.45	0.56	93.1	91.4	2.7	0.25	0.39	90.7	85.6	6.42	0.48	0.82	92.5	87.2	0.63	0.31	0.40	50.8	36.5
24	M	9.1	1.4	1.0	84.6	89.0	5.0	1.1	0.89	78.0	82.2	4.60	0.28	0.43	93.9	90.7	0.43	0.13	0.10	69.8	76.7
25	T	7.9	1.4	0.47	82.3	94.1	3.3	1.1	0.20	66.7	93.9	5.44	0.21	0.51	96.1	90.6	0.48	0.14	0.14	70.8	70.8
26	W	7.8	0.69	0.29	91.2	96.3	2.7	0.40	0.16	85.2	94.1	5.92	0.32	0.56	94.6	90.5	0.60	0.12	0.08	80.0	86.7
27	Th	7.2	0.60	0.29	91.7	96.0	2.3	0.32	0.17	86.1	92.6	5.86	0.30	0.44	94.9	92.5	0.53	0.14	0.11	73.6	79.2
28	F	7.9	0.70	0.37	91.1	95.3	2.5	0.35	0.18	86.0	92.8	6.52	0.34	0.66	94.8	89.9	0.45	0.07	0.09	84.4	80.0
29	Sa	6.1	0.56	0.30	90.8	95.1	1.8	0.21	0.13	88.3	92.8	6.80	0.39	0.57	94.3	91.6	0.34	0.08	0.31	76.5	8.8
30	Su	6.7	0.46	0.44	93.1	93.4	2.7	0.24	0.30	91.1	88.9	5.34	0.31	0.55	94.2	89.7	0.27	0.07	0.21	74.1	22.2
31	M	8.6	0.50	1.1	94.2	87.2	3.9	0.35	0.91	91.0	76.7	4.86	0.19	0.46	96.1	90.5	0.46	0.10	0.05	78.3	89.1

PLANT OPERATIONAL DATA

SEPTEMBER 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/1 as P			% Removal		mg/1 as P			% Removal		mg/1 as Fe			% Removal		mg/1 as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	T	8.8	0.55	0.45	93.8	94.9	3.9	0.21	0.35	94.6	91.0	5.76	0.25	0.52	95.7	91.0	0.66	0.08	0.14	87.9	78.8
2	W	6.8	0.61	0.39	91.0	94.3	2.2	0.29	0.23	86.8	89.5	6.26	0.29	0.50	95.4	92.0	0.55	0.13	0.33	76.4	40.0
3	Th	5.2	0.50	0.58	90.4	88.8	2.0	0.20	0.20	90.0	90.0	5.64	0.34	1.00	94.0	82.3	0.58	0.08	0.11	86.2	81.0
4	F	7.5	0.75	0.50	90.0	93.3	1.6	0.39	0.31	75.6	80.6	8.02	0.59	0.85	92.6	89.4	0.65	0.11	0.09	83.1	86.2
5	Sa	8.0	0.39	0.33	95.1	95.9	2.8	0.21	0.17	92.5	93.9	6.68	0.23	0.56	96.6	91.6	0.47	0.06	0.03	87.2	93.6
6	Su	3.2	0.33		89.7		0.80	0.20		75.0		5.18	0.13		97.5		0.31	0.06		80.6	
7	M	6.1	0.95	0.71	84.4	88.4	2.9	0.75	0.46	74.1	84.1	4.06	0.18	0.51	95.6	87.4	0.39	0.03	0.05	92.3	87.2
8	T	8.0	1.4	1.0	82.5	87.5	3.1	1.2	0.83	61.3	73.2	6.22	0.13	0.49	97.9	92.1	0.58	0.05	0.03	91.4	94.8
9	W	6.6	1.0	0.43	84.8	93.5	2.9	0.46	0.27	84.1	90.7	4.66	0.20	0.38	95.7	91.8	0.50	0.07	0.08	86.0	84.0
10	Th	7.3	0.91	0.37	87.5	94.9	2.8	0.62	0.17	77.9	93.9	5.28	0.22	0.86	95.8	83.7	0.55	0.05	0.12	90.9	78.2
11	F	8.3	0.55	0.98	93.4	88.2	3.4	0.35	0.41	89.7	87.9	5.58	0.45	1.42	91.9	74.6	0.74	0.08	0.07	89.2	90.5
12	Sa	7.6	0.32	1.2	95.8	84.2	2.3	0.21	0.21	90.9	90.9	6.30	0.21	2.67	96.7	57.6	0.40	0.06	0.05	85.0	87.5
13	Su	5.2	0.38	0.60	92.7	88.5	2.2	0.20	0.14	90.9	93.6	4.56	0.27	1.20	94.1	73.7	0.38	0.04	0.01	89.5	97.4
14	M	6.8	0.40	1.2	94.1	82.4	2.8	0.23	0.22	91.8	92.1	4.74	0.22	2.86	95.4	39.7	0.42	0.11	0.00	73.8	99.9
15	T	4.5	0.35	0.73	92.2	83.8	1.6	0.19	0.18	88.1	88.8	5.30	0.17	1.69	96.8	68.1	0.43	0.09	0.05	79.1	88.4
16	W	7.2	0.49	0.46	93.2	93.6	2.6	0.31	0.20	88.1	92.3	5.98	0.18	0.91	97.0	84.8	0.41	0.07	0.07	82.9	82.9
17	Th	6.0	0.85	0.32	85.8	94.7	1.8	0.37	0.14	79.4	92.2	5.22	0.97	0.66	81.4	87.4	0.35	0.10	0.04	71.4	88.6
18	F	6.4	0.40	0.38	93.8	94.1	2.4	0.16	0.15	93.3	93.8	4.84	0.23	0.68	95.2	86.0	0.44	0.15	0.01	65.9	97.7
19	Sa	7.3	0.40	0.33	94.5	95.5	3.6	0.26	0.16	92.8	95.6	4.48	0.14	0.65	96.9	85.5	0.25	0.02	0.05	92.0	80.0
20	Su		0.41	0.33				0.27	0.22				0.11	0.38				0.07	0.07		
21	M	8.2	1.7	0.53	79.3	93.5	2.8	1.5	0.38	46.4	86.4	5.50	0.35	0.47	93.6	91.5	0.29	0.12	0.17	58.6	41.4
22	T	6.8	0.82	0.35	87.9	94.9	2.1	0.55	0.19	73.8	91.0	6.14	0.28	0.52	95.4	91.5	0.51	0.08	0.13	84.3	74.5
23	W	6.2	0.91	0.40	85.3	93.5	2.0	0.41	0.19	79.5	90.5	5.86	0.70	0.57	88.1	90.3	0.34	0.13	0.13	61.8	61.8
24	Th	4.9	1.0	0.57	79.6	88.4	1.7	0.60	0.12	64.7	92.9	4.92	0.72	1.24	85.4	74.8	0.36	0.16	0.10	55.6	72.2
25	F	6.3	0.43	0.56	93.2	91.1	2.2	0.21	0.19	90.5	91.4	5.70	0.27	1.17	95.3	79.5	0.25	0.10	0.11	60.0	56.0
26	Sa	6.7	0.74	0.39	89.0	94.2	1.8	0.33	0.14	81.7	92.2	7.52	0.51	0.53	93.2	93.0	0.32	0.05	0.04	84.4	87.5
27	Su	6.0	0.54	0.67	91.0	88.8	2.4	0.26	0.21	89.2	91.3	4.52	0.52	1.22	88.5	73.0	0.23	0.08	0.06	65.2	73.9
28	M	8.9	1.8	1.4	79.8	84.3	3.6	1.3	0.83	63.9	76.9	5.80	0.48	1.13	91.7	80.5	0.34	0.06	0.18	82.4	47.1
29	T	7.3	1.3	0.47	83.3	94.0	3.1	1.0	0.25	67.7	91.9	5.32	0.32	0.57	94.0	89.3	0.40	0.07	0.07	82.5	82.5
30	W	8.0	0.56	0.33	93.0	95.9	2.8	0.37	0.17	86.8	93.9	6.40	0.24	0.42	96.3	93.4	0.46	0.06	0.06	87.0	87.0
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PLANT OPERATIONAL DATA

OCTOBER 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/l as P			% Removal		mg/l as P			% Removal		mg/l as Fe			% Removal		mg/l as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Th	8.4	0.58	0.35	93.1	95.8	2.2	0.32	0.19	85.5	91.4	8.58	0.43	0.53	95.0	93.8	0.39	0.25	0.12	35.9	69.2
2	F	9.0	0.71	0.52	92.1	94.2	3.1	0.40	0.30	87.1	90.3	6.96	0.41	0.77	94.1	88.9	0.42	0.09	0.09	78.6	78.6
3	Sa	8.6	0.43	0.43	95.0	95.0	3.8	0.25	0.21	93.4	94.5	5.78	0.32	0.58	94.5	90.0	0.36	0.07	0.06	80.6	83.3
4	Su	7.3	0.48	0.46	93.4	93.7	3.1	0.28	0.17	91.0	94.5	5.68	0.13	0.76	97.7	86.6	0.32	0.08	0.13	75.0	59.4
5	M	9.4	1.3	0.58	86.2	93.8	3.1	1.1	0.28	64.5	91.0	7.96	0.39	0.68	95.1	91.5	0.47	0.13	0.07	72.3	85.1
6	T	8.7	0.95	0.57	89.1	93.4	3.1	0.59	0.31	81.0	90.0	6.44	0.37	0.61	94.3	90.6	0.45	0.18	0.07	60.0	84.4
7	W	8.2	1.0	0.76	87.8	90.7	3.1	0.60	0.33	80.6	89.4	6.40	0.48	1.40	92.5	78.1	0.59	0.13	0.39	78.0	33.9
8	Th	7.9	1.7	0.77	78.5	90.3	3.0	0.65	0.33	78.3	89.0	6.30	0.93	1.49	85.2	76.3	0.48	0.10	0.08	79.2	83.3
9	F	7.7	1.1	2.6	85.7	66.2	2.2	0.55	0.26	75.0	88.2	6.72	0.40	4.40	94.0	34.5	0.38	0.06	0.08	84.2	78.9
10	Sa	8.3	0.60	0.60	92.8	92.8	3.0	0.26	0.20	91.3	93.3	7.04	0.36	0.91	94.9	87.1	0.35	0.07	0.10	80.0	71.4
11	Su	7.9	0.54	0.41	93.2	94.8	2.8	0.21	0.15	92.5	94.6	6.76	0.71	0.67	89.5	90.1	0.26	0.07	0.07	73.1	73.1
12	M	10.4	0.84	0.60	91.9	94.2	3.8	0.61	0.28	83.9	92.6	7.20	0.52	0.22	92.8	96.9	0.34	0.01	0.02	97.1	94.1
13	T	8.9	0.76	0.60	91.5	93.3	3.2	0.45	0.40	85.9	87.5	7.04	0.28	0.54	96.0	92.3	0.49	0.05	0.03	89.8	93.9
14	W	8.8	1.2	0.81	86.4	90.8	2.5	0.72	0.41	71.2	83.6	7.70	0.43	1.10	94.4	85.7	0.41	0.04	0.03	90.2	92.7
15	Th	9.6	2.9	3.2	69.8	66.7	3.2	2.0	0.32	37.5	90.0	7.98	0.66	3.26	91.7	59.1	0.43	0.10	0.01	76.7	97.7
16	F	10.3	3.2	4.0	68.9	61.2	3.0	2.5	0.16	16.7	94.7	7.24	0.52	6.76	92.8	6.6	0.36	0.13	0.07	63.9	80.6
17	Sa	10.2	1.7	1.1	83.3	89.2	3.3	1.1	0.12	66.7	96.4	7.28	0.40	1.79	94.5	75.4	0.41	0.08	0.06	80.5	85.4
18	Su	8.6	0.45	0.68	94.8	92.1	3.0	0.23	0.15	92.3	95.0	6.66	0.19	1.04	97.1	84.4	0.44	0.07	0.05	84.1	88.6
19	M	10.0	0.62	0.48	93.8	95.2	3.8	0.30	0.28	92.1	92.6	7.86	0.48	0.71	93.9	91.0	0.89	0.36	0.28	59.6	68.5
20	T	8.7	1.5	0.54	82.8	93.8	2.5	0.70	0.29	72.0	88.4	9.74	0.76	0.76	92.2	92.2	1.36	0.27	0.19	80.1	86.0
21	W	8.5	1.5	0.64	82.4	92.5	3.0	0.92	0.41	69.3	86.3	8.98	0.77	0.81	91.4	91.0	1.41	0.27	0.23	80.9	83.7
22	Th	8.4	2.1	1.7	75.0	79.8	3.1	1.7	0.27	45.2	91.3	7.60	0.67	2.82	91.2	62.9	0.87	0.26	0.20	70.1	77.0
23	F	8.7	2.5	4.6	71.3	47.1	3.4	1.9	0.13	44.1	96.2	10.24	0.81	8.90	92.1	13.1	1.43	0.32	0.27	77.6	31.1
24	Sa	9.4	0.80	1.1	91.5	88.3	2.4	0.19	0.12	92.1	95.0	12.98	0.87	2.30	93.3	82.3	0.38	0.30	0.19	21.1	50.0
25	Su	8.0	0.63	0.58	92.1	92.8	2.4	0.19	0.16	92.1	93.3	11.84	0.67	1.05	94.3	91.1	0.81	0.13	0.14	84.0	82.7
26	M	10.9	1.3	0.48	88.1	95.6	3.0	0.96	0.17	68.0	94.3	11.44	0.45	0.83	96.1	92.7	0.47	0.14	0.32	70.2	31.9
27	T	8.0	1.1	0.48	86.3	94.0	2.8	0.80	0.16	71.4	94.3	8.80	0.54	1.07	93.9	87.8	0.78	0.20	0.24	74.4	69.2
28	W	13.0	1.9	0.50	85.4	96.2	9.0	1.5	0.29	83.3	96.8	7.84	0.37	0.68	95.3	91.3	0.90	0.06	0.13	93.3	85.6
29	Th	8.4	2.4	1.9	71.4	77.4	2.7	2.0	0.88	25.9	67.4	8.96	0.58	2.69	93.5	70.0	0.85	0.12	0.20	85.9	76.5
30	F	8.2	1.3	1.1	84.1	86.6	2.0	0.60	0.22	70.0	89.0	10.62	0.78	2.27	92.7	78.6	0.33	0.10	0.17	69.7	48.5
31	Sa	6.9	0.43	0.95	93.8	86.2	2.3	0.16	0.14	93.0	93.9	9.92	0.37	2.10	96.3	78.8	0.81	0.05	0.06	93.8	92.6

PLANT OPERATIONAL DATA NOVEMBER 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/l as P			% Removal		mg/l as P			% Removal		mg/l as Fe			% Removal		mg/l as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	Su	6.9	0.43	0.35	93.8	94.9	2.0	0.16	0.13	92.0	93.5	10.30	0.36	0.58	96.5	94.4	0.54	0.05	0.10	90.7	81.5
2	M	6.4	0.48	0.25	92.5	96.1	2.9	0.40	0.13	86.2	95.5	5.98	0.08	0.53	98.7	91.1	0.50	0.05	0.07	90.0	86.0
3	T	6.8	0.47	0.43	93.1	93.7	2.7	0.23	0.12	91.5	95.6	6.66	0.33	0.80	95.0	88.0	0.64	0.04	0.67	93.8	
4	W	7.2	0.56	0.29	92.2	96.0	2.0	0.20	0.10	90.0	95.0	8.88	0.45	0.52	94.9	94.1	0.86	0.07	0.05	91.9	94.2
5	Th	8.0	0.76	0.40	90.5	95.0	4.0	0.46	0.14	88.5	96.5	7.60	0.38	0.73	95.0	90.4	0.65	0.08	0.02	87.7	96.9
6	F	7.1	1.1	0.84	84.5	88.2	2.6	0.60	0.13	76.9	95.0	7.50	0.53	1.90	92.9	74.7	1.03	0.07	0.14	93.2	86.4
7	Sa	7.9	0.76	0.49	90.4	93.8	2.6	0.35	0.12	86.5	95.4	8.80	0.50	1.18	94.3	86.6	0.72	0.10	0.09	86.1	87.5
8	Su	7.3	0.42	0.41	94.2	94.4	2.3	0.24	0.11	89.6	95.2	9.06	0.26	0.75	97.1	91.7	0.27	0.03	0.09	88.9	66.7
9	M	8.0	0.79	0.32	90.1	96.0	2.6	0.52	0.12	80.0	95.4	7.28	0.39	0.59	94.6	91.9	0.45	0.09	0.20	80.0	55.6
10	T	8.9	0.70	0.27	92.1	97.0	2.2	0.46	0.13	79.1	94.1	9.26	0.27	0.41	97.1	95.6	0.24	0.09	0.18	62.5	25.0
11	W	7.8	0.79	0.28	89.9	96.4	2.7	0.56	0.12	79.3	95.6	6.44	0.29	0.48	95.5	92.5	0.49	0.10	0.21	79.6	57.1
12	Th	8.3	0.80	0.32	90.4	96.1	2.6	0.70	0.14	73.1	94.6	6.80	0.23	0.51	96.6	92.5	0.51	0.11	0.13	78.4	74.5
13	F	7.8	0.93	0.54	88.1	93.1	2.1	0.81	0.12	61.4	94.3	7.50	0.34	1.07	95.5	85.7	0.40	0.11	0.09	72.5	77.5
14	Sa	7.6	0.78	0.30	89.7	96.1	2.5	0.25	0.10	90.0	96.0	7.84	0.39	0.55	95.0	93.0	0.54	0.08	0.08	85.2	85.2
15	Su	7.5	0.64	0.27	91.5	96.4	2.4	0.19	0.10	92.1	95.8	7.54	0.40	0.47	94.7	93.8	0.45	0.10	0.11	77.8	75.6
16	M	10.4	0.77	0.34	92.6	96.7	3.4	0.45	0.15	86.8	95.6	7.24	0.31	0.56	95.7	92.3	0.44	0.08	0.13	81.8	70.5
17	T	9.6	0.72	0.50	92.5	94.8	2.9	0.45	0.20	84.5	93.1	8.34	0.28	0.70	96.6	91.6	0.61	0.07	0.20	88.5	67.2
18	W	9.1	0.84	0.66	90.8	92.7	2.7	0.55	0.17	79.6	93.7	7.72	0.32	1.20	95.9	84.5	0.49	0.10	0.08	79.6	83.7
19	Th	9.8	2.2	1.0	77.6	89.8	2.0	0.74	0.16	63.0	92.0	9.16	1.04	2.05	88.6	77.6	0.45	0.13	0.23	71.1	48.9
20	F	8.2	0.78	3.0	90.5	63.4	2.6	0.40	0.13	84.6	95.0	7.70	0.48	6.15	93.7	20.1	0.40	0.07	0.14	82.5	65.0
21	Sa	7.8	0.33	0.51	95.8	93.5	2.2	0.20	0.14	90.9	93.6	7.34	0.30	1.57	95.9	78.6	0.45	0.17	0.09	62.2	80.0
22	Su	8.4	0.41	0.42	95.1	95.0	3.2	0.25	0.14	92.2	95.6	7.64	0.24	0.72	96.9	90.6	0.28	0.10	0.17	64.3	39.3
23	M	9.7	1.7	0.65	82.5	93.3	2.8	1.2	0.16	57.1	94.3	9.14	0.48	1.24	94.7	86.4	0.41	0.09	0.07	78.0	82.9
24	T	8.3	0.90	1.1	89.2	86.7	2.7	0.61	0.15	77.4	94.4	6.90	0.92	3.00	86.7	56.5	0.57	0.08	0.04	86.0	93.0
25	W	8.6	1.9	0.66	77.9	92.3	3.9	0.73	0.20	81.3	94.9	7.86	0.87	1.22	88.9	84.5	0.43	0.04	0.06	90.7	86.0
26	Th	7.4	0.67	0.51	90.9	93.1	2.1	0.50	0.15	76.2	92.9	7.56	0.19	0.94	97.5	87.6	0.76	0.08	0.06	89.5	92.1
27	F	8.5	0.60	0.31	92.9	96.4	4.1	0.25	0.12	93.9	97.1	7.18	0.31	0.38	95.7	94.7	0.85	0.10	0.06	88.2	92.9
28	Sa	8.1	0.69	0.34	91.5	95.8	3.5	0.55	0.13	84.3	96.3	7.46	0.11	0.31	98.5	95.8	0.60	0.04	0.03	93.3	95.0
29	Su	7.2	1.7	0.33	76.4	95.4	3.3	1.5	0.19	54.5	94.2	5.58	0.15	0.55	97.3	90.1	0.51	0.03	0.02	94.1	96.1
30	M	9.2	3.6	0.77	60.9	91.6	3.9	3.3	0.32	15.4	91.8	10.24	0.53	1.22	94.8	88.1	0.56	0.08	0.14	85.7	75.0
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PLANT OPERATIONAL DATA

DECEMBER 1970

Date	Day	Total Phosphorus					Total Soluble Phosphorus					Total Iron					Total Soluble Iron				
		mg/l as P			% Removal		mg/l as P			% Removal		mg/l as Fe			% Removal		mg/l as Fe			% Removal	
		SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE	SS	WPE	EPE	WPE	EPE
1	T	7.9	2.0	0.50	74.7	93.7	3.0	1.6	0.19	46.7	93.7	9.60	0.54	0.94	94.4	90.2	0.68	0.12	0.23	82.4	66.2
2	W	8.1	0.83	0.39	89.8	95.2	2.8	0.59	0.14	78.9	95.0	10.86	0.39	0.81	96.4	92.5	0.61	0.09	0.12	85.2	80.3
3	Th	8.1	1.1	0.45	86.4	94.4	2.5	0.42	0.16	83.2	93.6	11.62	0.77	1.01	93.4	91.3	0.84	0.20	0.17	76.2	79.8
4	F	9.0	1.6	0.69	82.2	92.3	2.8	0.44	0.12	84.3	95.7	12.50	1.43	2.41	88.6	80.7	1.28	0.14	0.23	89.1	82.0
5	Sa	9.8	0.72	0.59	92.7	94.0	3.6	0.48	0.11	86.7	96.9	11.64	0.47	1.93	96.0	83.4	0.78	0.10	0.30	87.2	61.5
6	Su	7.8	0.39	0.38	95.0	95.1	2.6	0.22	0.12	91.5	95.4	9.52	0.27	0.78	97.2	91.8	0.54	0.09	0.30	83.3	44.4
7	M	9.9	0.95	0.41	90.4	95.8	4.4	0.82	0.15	81.4	96.6	7.02	0.43	0.62	93.9	91.2	0.80	0.11	0.19	86.3	76.3
8	T	8.9	1.5	1.0	83.1	88.8	3.0	0.81	0.21	73.0	93.0	9.14	0.51	2.32	94.4	74.6	0.84	0.13	0.14	84.5	83.3
9	W	8.5	0.71	0.53	91.6	93.8	2.9	0.42	0.22	85.5	92.4	8.22	0.47	1.43	94.3	82.6	0.67	0.15	0.23	77.6	65.7
10	Th		1.2	2.3				0.76	0.13				0.52	4.22				0.15	0.24		
11	F	6.6	2.2	3.9	66.7	40.9	1.8	0.40	0.12	77.8	93.3	6.84	1.30	13.72	81.0		0.58	0.13	0.27	77.6	53.4
12	Sa	7.4	0.64	0.85	91.4	88.5	2.9	0.25	0.12	91.4	95.9	5.66	1.07	2.72	81.1	51.9	0.68	0.11	0.21	83.8	69.1
13	Su	6.9	0.79	1.4	88.6	79.7	3.2	0.57	0.11	82.2	96.6	5.00	0.30	4.87	94.0	2.6	0.60	0.12	0.13	80.0	78.3
14	M	8.8	3.0	1.1	65.9	87.5	3.7	2.7	0.19	27.0	94.9	5.70	0.28	3.45	95.1	39.5	0.72	0.17	0.15	76.4	79.2
15	T	7.6	1.9	0.35	75.0	95.4	2.7	1.6	0.16	40.7	94.1	6.30	0.39	0.41	93.8	93.5	0.51	0.19	0.09	62.7	82.4
16	W	6.1	1.1	0.36	82.0	94.1	1.9	0.81	0.15	57.4	92.1	6.68	0.33	0.63	95.1	90.6	0.67	0.27	0.13	59.7	80.6
17	Th	6.5	1.2	0.30	81.5	95.4	1.8	0.56	0.14	68.9	92.2	7.46	0.47	0.58	93.7	92.2	0.40	0.07	0.22	82.5	45.0
18	F	6.3	0.94	1.1	85.1	82.5	1.4	0.64	0.08	54.3	94.3	6.24	0.31	3.07	95.0	50.8	0.36	0.09	0.09	75.0	75.0
19	Sa	6.7	0.46	1.2	93.1	82.1	1.7	0.22	0.10	87.1	94.1	6.30	0.23	3.04	96.3	51.7	0.33	0.02	0.09	93.9	72.7
20	Su	6.9	0.36	0.50	94.8	92.8	2.1	0.16	0.10	92.4	95.2	6.90	0.24	0.97	96.5	85.9	0.52	0.05	0.20	90.4	61.5
21	M	7.6	0.68	0.30	91.1	96.1	2.4	0.47	0.18	80.4	92.5	6.74	0.20	0.65	97.0	90.4	0.31	0.05	0.08	83.9	74.2
22	T	7.1	1.7	0.78	76.1	89.0	1.9	1.4	0.29	26.3	84.7	6.96	0.36	1.53	94.8	78.0	0.39	0.10	0.18	74.4	53.8
23	W	7.0	1.1	1.2	84.3	82.9	2.2	0.90	0.17	59.1	92.3	5.76	0.22	3.06	96.2	46.9	0.36	0.14	0.09	61.1	75.0
24	Th	6.6	0.96	0.77	85.5	88.3	2.6	0.65	0.17	75.0	93.5	5.40	0.35	2.07	93.5	61.7	0.32	0.14	0.09	56.3	71.9
25	F	8.2	0.46	0.19	94.4	97.7	1.1	0.17	0.13	84.5	88.2	6.64	0.28	0.26	95.8	96.1	0.35	0.15	0.15	57.1	57.1
26	Sa	6.7	0.41	0.21	93.9	96.9	2.7	0.22	0.13	91.9	95.2	6.06	0.50	0.93	91.7	84.7	0.36	0.33	0.09	8.3	75.0
27	Su	6.6	1.1	0.33	83.3	95.0	2.5	0.93	0.17	62.8	93.2	6.06	0.39	0.49	93.6	91.9	0.35	0.10	0.13	71.4	62.9
28	M	8.5	3.1	0.68	63.5	92.0	4.2	2.5	0.53	40.5	87.4	5.64	0.47	0.40	91.7	92.9	0.58	0.07	0.09	87.9	84.5
29	T	7.8	2.2	0.49	71.8	93.7	2.9	1.9	0.33	34.5	88.6	7.68	0.41	0.47	94.7	93.9	0.59	0.14	0.15	76.3	74.6
30	W	8.7	1.6	0.29	81.6	96.7	2.9	1.4	0.17	51.7	94.1	7.16	0.23	0.38	96.8	94.7	0.66	0.13	0.15	80.3	77.3
31	Th	7.6	1.1	0.29	85.5	96.2	3.7	0.62	0.15	83.2	95.9	4.76	0.44	0.49	90.8	89.7	0.67	0.09	0.05	86.6	92.5

PLANT OPERATIONAL DATA JANUARY 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor							Return Sludge (Dry Basis)							
				East Plant	pH		Suspended Solids mg/1		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/1	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	Th			91.4			2550	2460	0.69	0.82								
2	F			114.3			2120	2350	0.83	0.90	2.71	2.64	7.20	7.05	1.65	2.50	23.60	24.79
3	Sa			95.3			2090	2270	0.84	0.96								
4	Su			93.3			1860	1830	0.76	0.86								
5	M			117.8			2400	2240	0.93	1.03	2.69	2.54	7.13	7.13	1.71	2.16	22.87	23.38
6	T			118.7			2730	2670	0.92	0.97								
7	W	12,000	11.5	124.6			3040	2650	0.88	0.88	2.50	2.40	6.95	6.82	1.65	2.21	23.51	24.29
8	Th	10,013	9.5	126.7			2950	2770	0.87	0.85	2.41	2.49	7.10	6.92	1.71	2.86	23.52	25.07
9	F	14,781	14.3	123.7			3050	3200	0.86	0.91	2.37	2.41	7.09	6.79	1.71	3.39	23.30	25.33
10	Sa			101.6			2930	3260	0.94	0.93	2.53	2.57	7.21	6.71	1.91	4.12	23.92	26.64
11	Su			93.3			2770	2870	0.92	0.94	2.81	2.75	7.12	6.91	2.24	4.21	24.95	27.54
12	M	17,466	17.2	121.9			2520	2710	0.95	0.95	2.78	2.79	6.85	6.70	2.55	4.54	25.50	28.12
13	T	12,470	12.2	122.7			2660	2820	0.92	1.03	2.47	2.79	6.67	6.42	2.21	5.05	24.14	28.28
14	W	13,746	13.6	121.4			2770	2920	0.92	0.98	2.31	2.77	6.77	6.26	1.93	5.07	23.56	28.44
15	Th	15,170	16.4	111.2	7.1	6.9	2540	2840	0.81	0.96	2.32	2.71	6.84	6.40	1.88	5.47	24.08	28.94
16	F	11,946	13.0	110.5	7.0	6.9	2840	2180	0.76	0.89	2.23	2.64	6.77	6.50	1.79	5.83	24.11	29.71
17	Sa			92.8			2830	1960	0.73	0.92	2.31	2.59	6.78	6.56	1.96	4.88	24.10	28.36
18	Su			80.0			2720	2690	0.80	0.99	2.61	2.86	6.95	6.58	2.07	5.69	24.66	30.30
19	M	10,382	11.8	105.7	7.0	7.2	2130	2390	0.82	0.98	2.65	2.96	6.78	6.43	2.27	5.61	24.70	30.11
20	T	15,194	17.4	104.4	7.1	7.1	2200	2680	0.94	0.95	2.40	2.95	6.43	6.18	2.13	6.14	24.04	30.54
21	W	15,762	18.0	104.9	7.0	7.0	2300	2610	0.93	1.03	2.27	2.78	6.56	6.28	1.88	6.34	23.23	36.74
22	Th	13,330	15.1	106.2	7.1	7.1	2440	2610	0.89	0.99	2.28	2.76	6.68	6.21	1.96	6.34	24.32	31.39
23	F	8,118	9.7	100.4	7.0	7.0	2770	2970	0.90	0.97	2.28	2.69	6.77	6.37	1.96	6.42	23.80	30.13
24	Sa			78.5	7.3	7.2	2780	2810	0.89	1.01	2.37	2.68	6.85	6.57	2.02	6.14	24.50	30.06
25	Su			67.4	7.4	7.3	2600	2510	0.94	1.05	2.51	2.86	6.89	6.50	2.33	5.94	24.76	30.32
26	M	7,526	8.8	102.3	7.3	7.3	2360	2450	0.99	1.07	2.46	2.92	6.71	6.36	2.07	5.94	24.54	30.83
27	T	9,216	10.3	107.8	7.1	7.1	2690	2500	1.11	1.07	2.31	2.92	6.70	6.18	2.05	6.00	24.61	30.84
28	W	6,624	6.7	119.3	7.0	7.1	2810	2890	1.19	1.14	2.18	2.78	6.23	6.05	2.05	5.83	25.44	36.04
29	Th	9,504	10.5	108.8	7.1	6.9	3220	3050	1.24	1.21	2.10	2.57	6.23	5.86	2.05	5.30	26.15	31.09
30	F	10,212	11.4	107.0	6.8	6.9	3280	3090	1.08	1.06	2.11	2.61	6.49	6.32	1.93	5.41	25.53	30.60
31	Sa			95.0	7.1	7.1	3250	3180	1.06	1.16	2.20	2.65	6.49	6.04	1.99	5.47	25.59	30.49

PLANT OPERATIONAL DATA FEBRUARY 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor							Return Sludge (Dry Basis)							
				East Plant	pH		Suspended Solids mg/1		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/1	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	Su			103.8	7.1	7.1	3110	2950	1.12	1.17	2.78	2.30	6.56	6.30	2.05	5.30	26.49	32.32
2	M	10,703	11.9	108.1	7.1	7.2	2760	2820	1.17	1.11	2.27	2.80	6.29	6.01	1.77	4.99	26.13	30.97
3	T	9,936	11.3	105.5	7.0	7.1	3140	3020	1.06	1.08	2.24	2.75	6.36	5.88	1.79	5.10	25.36	30.42
4	W	8,784	10.3	102.2	6.9	7.0	2790	2730	1.14	1.13	2.17	2.66	6.40	5.93	1.77	5.05	24.78	29.81
5	Th	9,656	11.0	104.8	6.9	6.9	2980	2840	1.13	1.10	2.16	2.54	6.51	6.01	1.68	4.99	24.38	28.74
6	F	10,011	10.9	110.0	6.9	6.9	3200	2450	1.07	0.94			6.61	6.29	1.71	4.71		
7	Sa			87.2			2970	3060	1.04	0.96			6.23	6.01	1.99	4.80		
8	Su			85.9			2810	3200	1.08	0.96	2.36	2.68	6.78	6.47	1.99	4.99	24.94	28.81
9	M	8,520	10.0	102.4	7.4	7.3	2290	2920	1.13	1.02	2.37	2.76	6.54	6.35	2.02	4.82	24.87	28.97
10	T	10,790	12.6	102.5	7.1	7.0	2670	2810	1.18	1.12	2.30	2.67	6.46	6.30	2.30	4.99	25.04	29.21
11	W	16,548	19.5	101.6	6.9	6.9	2820	2770	1.14	1.08	2.29	2.58	6.49	6.15	2.16	5.30	25.29	29.42
12	Th	15,347	18.1	101.7	7.0	7.0	2870	3100	1.16	1.16	2.24	2.53	6.64	6.23	2.05	5.69	25.13	29.75
13	F	7,740	9.1	101.9			2920	3110	1.04	1.10	2.24	2.49	6.75	6.21	1.93	5.61	24.97	29.50
14	Sa			89.0			2950	2950	0.98	1.10	2.37	2.61	6.85	6.33	2.05	5.38	25.08	29.75
15	Su			82.6	7.2	7.1	2750	2950	1.07	1.21	2.50	2.77	6.81	6.30	2.07	5.35	25.12	29.70
16	M	7,124	8.8	97.5	7.2	7.1	2140	2550	1.17	1.21	2.54	2.82	6.58	6.21	2.16	5.13	25.42	29.49
17	T	8,819	10.6	100.1	7.0	6.7	2330	2630	1.07	1.18	2.38	2.77	6.33	5.98	2.16	5.02	24.68	29.20
18	W	11,307	13.6	100.0	7.1	6.9	2730	2600	1.18	1.15	2.34	2.64	6.50	6.07	1.93	5.02	24.50	29.09
19	Th	10,574	12.8	99.4	6.8	6.5	2650	2700	1.09	1.24	2.29	2.54	6.57	6.19	1.88	5.19	24.52	28.86
20	F	8,354	9.9	101.5	7.0	7.0	2690	2870	1.08	1.06	2.31	2.55	6.56	6.12	1.85	5.24	24.48	28.61
21	Sa			90.3			2830	3070	1.10	1.06	2.51	2.76	6.68	6.29	2.05	5.13	25.21	29.11
22	Su			86.2			2590	2760	1.08	1.17	2.56	2.83	6.58	6.12	2.07	4.91	25.98	29.99
23	M	11,111	13.2	100.7	7.2	7.4	2170	2330	1.15	1.10	2.57	2.88	6.36	6.00	2.16	4.91	26.33	30.20
24	T	10,688	12.6	102.0	6.7	7.0	2500	2450	1.20	1.12	2.35	2.81	6.26	5.86	1.99	5.07	25.95	30.41
25	W	11,263	13.4	100.8	6.7	6.6	2600	2600	1.15	1.24	2.31	2.66	6.36	5.93	1.99	5.13	25.78	30.08
26	Th	10,640	12.7	100.2	7.0	6.7	2690	2780	1.13	1.14	2.30	2.58	6.58	6.11	1.93	5.52	25.78	30.30
27	F	10,544	12.5	101.0	6.7	6.6	2670	2750	1.08	1.12	2.33	2.41	6.54	6.12	2.13	5.30	25.66	30.27
28	Sa			87.4			2620	2760	1.08	1.05	2.49	2.54	6.67	6.28	2.27	5.66	26.21	30.18
29																		
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31																		

PLANT OPERATIONAL DATA

MARCH 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor							Return Sludge (Dry Basis)							
				East Plant	pH		Suspended Solids mg/l		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/l	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	Su			85.7			2630	2660	1.17	1.12	2.53	2.72	6.47	6.23	2.47	5.55	26.36	30.13
2	M	10,976	12.0	109.6	7.1	7.1	2170	2420	1.25	1.21	2.49	2.78	6.28	6.01	2.38	5.35	25.93	29.85
3	T	10,470	10.4	121.3	7.2	7.1	2630	2340	1.38	1.40	2.20	2.52	5.74	5.49	2.13	5.07	27.36	31.17
4	W	9,726	10.6	110.2	7.1	7.0	2810	2940	1.37	1.37	2.05	2.31	5.69	5.38	2.10	5.19	28.27	31.80
5	Th	10,599	12.0	105.9	7.0	6.9	2900	2920	1.33	1.39	2.08	2.32	5.97	5.55	2.02	5.30	27.53	31.22
6	F	11,036	12.6	105.1	7.1	6.9	2930	2730	1.09	1.14	2.15	2.41	6.23	5.74	1.96	5.19	26.65	30.42
7	Sa			89.9			2830	2780	1.02	1.13	2.24	2.55	6.37	5.86	1.93	5.41	27.04	32.15
8	Su			80.0			2750	2680	1.13	1.19	2.40	2.74	6.57	5.98	2.21	5.52	27.28	32.60
9	M	10,370	11.9	104.8	7.5	7.3	2590	2550	1.21	1.19	2.47	2.82	6.40	5.97	2.21	5.41	27.41	32.70
10	T	10,790	12.8	100.8	7.0	7.0	2550	2590	1.23	1.21	2.39	2.76	6.37	5.84	2.24	5.52	26.63	32.09
11	W	11,337	12.9	105.6	6.8	6.8	2780	2580	1.16	1.21	2.30	2.68	6.37	6.00	2.10	5.58	26.00	31.91
12	Th	11,180	12.8	104.3	6.9	6.9	2840	2560	1.15	1.06	2.29	2.61	6.56	6.16	1.93	5.58	25.51	30.68
13	F	10,512	12.3	102.3	6.9	6.9	2810	2560	1.02	1.03	2.27	2.56	6.71	6.21	1.82	5.61	29.16	31.22
14	Sa			83.0			2720	2750	0.94	1.03	2.31	2.58	6.77	6.33	1.88	5.30	25.78	30.93
15	Su			78.0			2600	2760	1.00	1.09	2.51	2.77	6.77	6.29	2.16	5.49	26.31	31.25
16	M	14,190	16.4	103.7	7.3	7.2	2060	2380	1.12	1.14	2.47	2.85	6.57	6.23	2.05	5.47	25.96	31.63
17	T	13,906	16.7	99.9	7.0	7.0	2230	2590	1.18	1.12	2.31	2.83	6.35	6.00	1.88	5.75	25.29	31.47
18	W	13,195	15.7	100.5	7.1	7.0	2390	2560	1.08	1.07	2.22	2.71	6.36	6.15	1.88	5.89	24.80	31.23
19	Th	16,779	17.0	118.3	6.9	6.8	2720	2580	1.09	1.10	2.62	2.57	6.42	6.28	1.88	5.49	24.78	30.26
20	F	14,970	15.6	114.7	7.0	7.0	2510	2530	1.13	1.07	2.06	2.42	6.29	6.14	1.54	5.92	25.69	31.36
21	Sa			89.4			2550	2800	1.08	1.07	2.19	2.45	6.51	6.09	1.77	5.83	26.75	32.34
22	Su			85.2			2340	2670	1.05	1.09	2.39	2.69	6.65	6.23	1.99	6.08	26.82	32.72
23	M	13,276	15.4	103.4	7.3	7.3	2180	2370	1.13	1.23	2.47	2.81	6.56	6.12	2.02	5.92	26.79	32.76
24	T	12,790	14.7	104.5	7.0	7.1	2370	2450	1.17	1.14	2.33	2.78	6.37	6.08	1.99	6.17	25.72	32.44
25	W	12,714	14.3	106.4	7.1	7.1	2540	2450	1.24	1.14	2.29	2.70	6.51	6.04	2.05	6.34	25.89	32.27
26	Th	10,748	11.1	116.0	7.0	7.0	2550	2560	1.25	1.17	2.20	2.53	6.32	6.16	1.93	5.86	26.21	32.21
27	F			102.8	6.9	7.0	2540	2540	1.18	1.13	2.20	2.47	6.61	6.28	1.77	5.02	26.19	32.22
28	Sa			90.8			2520	2520	1.12	1.12	2.23	2.48	6.63	6.25	1.88	5.13	26.57	31.39
29	Su			79.5			2360	2570	1.18	1.24	2.36	2.63	6.75	6.33	1.82	4.96	27.04	31.78
30	M	13,052	15.3	102.1	7.4	7.4	2040	2200	1.21	1.18	2.35	2.62	6.54	6.28	1.85	5.02	26.46	31.49
31	T	13,423	15.6	102.9	7.1	7.0	2200	2390	1.26	1.14	2.26	2.64	6.44	6.16	1.71	5.35	25.55	31.40

PLANT OPERATIONAL DATA APRIL 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor							Return Sludge (Dry Basis)							
				East Plant	pH		Suspended Solids mg/1		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/1	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	W	13,664	15.0	109.5	7.2	7.0	2460	2380	1.25	1.06	2.16	2.56	6.46	6.32	1.65	5.55	25.54	31.39
2	Th	12,986	13.6	114.7	7.1	7.1	2620	2540	1.23	1.13	2.06	2.41	6.63	6.29	1.51	5.21	26.00	31.50
3	F	14,188	15.3	111.5	7.0	7.0	2530	2380	1.13	1.06	2.03	2.33	6.40	6.11	1.46	5.72	26.75	32.06
4	Sa			92.9	7.0	7.0	2660	2550	1.09	1.01	2.16	2.38	6.65	6.26	1.60	5.78	26.61	32.19
5	Su			97.5			2440	2630	1.09	1.07	2.24	2.51	6.74	6.39	1.82	5.38	26.62	31.86
6	M	12,853	14.3	107.6	7.3	7.3	1910	2380	1.17	1.15	2.19	2.53	6.58	6.11	1.74	5.27	26.31	32.05
7	T	13,186	14.5	108.9			2230	2480	1.14	1.03	2.15	2.58	6.58	6.12	1.65	5.61	25.80	32.43
8	W	13,005	14.2	109.9	7.0	7.0	2410		1.11	1.08	2.10	2.50	6.67	6.15	1.51	5.47	25.51	31.95
9	Th	12,824	14.3	107.7	6.9	7.0	2770	2510	1.07	0.90	2.12	2.45	6.74	6.28	1.71	5.47	25.86	31.73
10	F	13,385	14.9	107.7	7.2	7.1	2790	2650	1.04	0.95	2.12	2.37	6.82	6.32	1.60	5.80	25.65	31.28
11	Sa			94.3			2860	2690	1.05	0.85	2.16	2.39	6.82	6.37	1.77	5.83	26.01	31.52
12	Su			86.5			2830	2730	1.08	0.96	2.30	2.52	6.84	6.36	1.82	5.61	26.37	31.49
13	M	12,882	13.1	117.8	7.4	7.3	2270	2590	1.09	0.97	2.22	2.56	6.50	6.07	1.85	5.55	27.11	31.84
14	T	13,628	14.2	115.3	7.2	7.2	2390	2660	1.16	0.92	2.08	2.47	6.28		1.74	5.55	26.84	32.17
15	W	12,583	13.0	115.7	7.2	7.2	2670	2730	1.14	0.89	2.07	2.41	6.21	6.02	1.65	5.69	26.28	32.25
16	Th	14,306	15.2	113.0	7.2	7.1	2820	2660	1.08	0.79	2.07	2.39	6.65	6.25	1.54	5.58	25.73	31.78
17	F	14,824	16.3	109.3	6.8	6.7	2890	2680	1.00	0.81	2.09	2.34	6.75	6.26	1.49	5.64	25.63	31.40
18	Sa			90.5			2800	2540	0.93	0.84	2.25	2.47	6.78	6.25	1.74	6.03	27.12	33.38
19	Su			109.4			2830	2650	1.10	0.95	2.37	2.53	6.46	6.30	2.16	5.75	27.07	32.14
20	M	12,432	13.0	114.8	7.0	7.0	2620	2470	1.13	0.96	2.34	2.55	6.46	6.07	2.07	6.00	27.38	32.42
21	T	13,410	14.4	111.7	7.0	6.8	2790	2700	1.19	0.96	2.23	2.51	6.46	5.98	1.88	5.69	26.77	32.24
22	W	13,104	13.7	114.8	6.8	6.9	2960	2610	1.13	0.95	2.18	2.43	6.56	6.21	1.77	5.55	26.05	31.79
23	Th	14,016	15.0	112.3	7.1	6.9	3030	2840	1.10	0.91	2.13	2.38	6.67	6.12	1.71	4.99	25.81	31.65
24	F	12,876	14.4	107.5	6.9	6.8	3240	2770	1.08	0.88	2.11	2.39	6.44	5.94	1.32	5.55	26.01	31.90
25	Sa			94.0			3340	2930	1.01	0.80	2.16	2.39	6.74	6.16	1.63	5.49	25.81	31.43
26	Su			88.4			3120	2820	1.05	0.90	2.33	2.51	6.91	6.19	1.60	5.55	25.96	31.45
27	M	10,184	10.4	117.6			2840	2810	1.10	0.95	2.36	2.62	6.79	6.32	1.54	5.47	26.10	31.48
28	T	10,234	9.9	123.4	7.0	7.0	2620	2790	1.06	0.98	2.34	2.64	6.65	6.14	1.51	5.10	25.66	31.05
29	W	12,528	12.1	124.3	7.2	6.9	3260	3140	1.08	0.88	2.23	2.58	6.77	6.37	1.60	5.27	25.30	30.70
30	Th	12,031	10.2	141.5	7.1	6.8	3230	2970	0.94	0.73	2.19	2.53	6.75	6.39	1.46	5.35	25.60	30.82
31																		

PLANT OPERATIONAL DATA MAY 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor							Return Sludge (Dry Basis)							
				East Plant	pH		Suspended Solids mg/l		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/l	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	F	12,750	12.3	124.4	6.9	6.9	3300	3000	0.86	0.59	2.14	2.42	6.74	6.35	1.43	5.19	24.63	30.72
2	Sa			102.2			3180	3280	0.93	0.82	2.18	2.44	6.63	6.11	1.43	5.16	26.18	31.08
3	Su			83.0			3170	3010	0.99	0.98	2.34	2.54	6.85	6.33	1.47	4.91	26.63	31.46
4	M	13,782	15.2	108.5	7.1	7.2	2810	2920	1.05	1.08	2.48	2.66	6.74	6.28	1.47	5.05	26.83	31.86
5	T	14,102	15.5	109.1	7.2	7.1	3000	3010	1.04	1.02	2.31	2.67	6.61	6.22	1.47	5.12	26.16	31.91
6	W	14,102	16.7	101.4	7.0	6.9	3050	3040	1.01	0.97	2.22	2.64	6.57	6.15	1.61	5.54	25.60	31.76
7	Th	13,367	14.7	108.7	6.8	6.7	2970	3080	1.03	0.77	2.13	2.56	6.67	6.08	1.68	5.47	25.61	31.94
8	F	10,179	10.4	117.0	6.6	6.6	3350	3060	0.91	0.46	2.07	2.49	6.71	6.22	1.54	5.61	25.41	31.76
9	Sa			108.2			3140	3240	0.91	0.69	2.10	2.52	6.79	6.26	1.54	5.33	25.92	31.83
10	Su			92.3			2860	3070	1.09	1.03	2.14	2.58	6.44	6.05	1.82	5.05	28.42	33.26
11	M	11,811	11.2	126.9	7.0	7.1	2810	2940	1.08	0.82	2.20	2.64	6.35	6.00	1.82	5.05	28.49	33.78
12	T	11,818	10.3	136.9	6.7	6.7	3040	2930	1.16	0.98	2.07	2.47	6.15	5.79	1.96	5.47	29.25	34.46
13	W	13,490	11.4	142.5	6.7	6.8	3110	2960	1.24	1.11	1.96	2.29	5.91	5.49	2.59	5.54	31.31	35.77
14	Th	12,782	10.7	143.5	6.8	6.9	3080	2890	1.23	1.14	1.92	2.25	6.09	5.51	2.52	5.75	30.96	36.13
15	F	11,967	9.8	147.1	7.0	7.0	3090	2970	1.24	1.11	1.89	2.19	6.25	5.69	1.82	5.89	30.60	35.63
16	Sa			129.4			3170	3250	1.17	0.93	1.95	2.16	6.30	5.66	2.31	5.54	30.32	35.12
17	Su			119.1			2990	3200	1.19	1.01	2.07	2.24	6.29	5.72	1.75	5.26	30.44	35.08
18	M	13,268	12.1	131.0	7.1	7.1	2760	2740	1.20	1.15	2.10	2.38	5.94	5.72	1.96	5.40	30.31	35.52
19	T	13,206	12.3	128.9	6.9	6.8	3070	2790	1.12	1.08	2.12	2.34	6.07	5.74	1.75	4.84	29.24	34.07
20	W	13,348	12.6	127.4	7.0	7.0	3020	2930	1.12	0.97	2.09	2.30	6.47	5.93	1.82	5.33	28.44	33.11
21	Th	13,311	12.6	126.2	6.9	6.8	2980	2780	1.02	0.85	2.09	2.30	6.65	6.15	1.68	5.47	27.83	32.41
22	F	11,956	11.4	125.5	7.2	7.1	3020	2920			2.03	2.26	6.67	6.22	1.89	5.54	27.23	31.80
23	Sa			120.0			3080	3200			2.06	2.31	6.53	5.97	1.89	5.68	28.06	32.98
24	Su			119.1			2770	3000	1.02	0.97								
25	M	13,160	12.8	122.9	7.5	7.3	2600	2840	1.00	0.91	2.17	2.44	6.56	6.15	1.96	5.26	28.63	32.64
26	T	10,608	10.5	121.0	7.1	7.1	2770	2740	0.96	0.76	2.23	2.51	6.63	5.95	1.89	5.54	27.88	32.52
27	W	12,739	12.6	121.4	7.2	7.2	2860	2830	0.91	0.64	2.22	2.47	6.77	6.36	2.03	5.40	27.50	31.88
28	Th	10,858	10.2	127.9	7.1	7.1	2880	2830	0.84	0.76	2.23	2.43	6.85	6.47	2.03	5.26	26.54	30.59
29	F			121.0			3020	2980	0.80	0.75	2.29	2.54	6.58	6.07	2.31	5.26	27.72	32.56
30	Sa			115.5			2990	3000	0.74	0.76	2.26	2.46	6.86	6.50	1.89	5.54	26.62	30.26
31	Su			105.5			2790	2760	0.93	0.96	2.27	2.57	6.81	6.49	1.89	4.70	27.78	31.13

PLANT OPERATIONAL DATA JUNE 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor							Return Sludge (Dry Basis)							
				East Plant	pH		Suspended Solids mg/l		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/l	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	M	12,312	11.8	138.7	7.4	7.0	2580	2610	0.99	0.98	2.25	2.51	6.42	6.14	1.89	4.49	29.54	33.25
2	T	13,628	12.0	135.6	7.1	6.9	2480	2290	1.00	0.99	2.27	2.44	6.16	5.77	2.17	5.40	31.09	35.03
3	W	12,701	10.8	141.4	7.3	7.3	2520	2450	1.11	1.06	2.10	2.36	6.14	5.98	2.10	5.54	30.46	31.55
4	Th	14,136	12.4	136.7	7.2	7.2	2750	2770	1.10	1.05	2.10	2.24	6.33	6.00	1.96	5.61	29.59	34.25
5	F	7,100	6.6	129.5	7.2	7.2	2820	2590	1.01	1.00	2.10	2.24	6.49	6.00	2.52	5.82	29.44	34.29
6	Sa	5,400	5.1	126.3			2810	2930	0.98	0.90	2.11	2.23	6.57	6.25	1.89	5.40	28.20	32.26
7	Su	4,666	4.8	116.2			2730	2810	1.05	0.98	2.16	2.37	6.68	6.22	1.75	5.54	28.07	32.79
8	M	7,862	7.0	134.5	7.3	7.2	2510	2680	1.05	1.01	2.23	2.51	6.67	6.15	1.75	5.82	27.83	32.81
9	T	9,729	8.4	139.0	7.3	7.1	2730	2630	0.95	1.04	2.19	2.53	6.58	6.12	1.61	5.26	27.12	31.86
10	W	9,976	8.4	142.0	7.1	7.0	2890	2770	0.76	0.84	2.16	2.49	6.60	6.25	1.47	5.26	26.50	31.30
11	Th	9,313	7.8	142.6	7.1	7.1	2800	2580	0.79	0.82	2.18	2.47	6.84	6.23	1.61	4.84	26.37	30.80
12	F	6,897	5.5	151.7	7.1	7.1	2620	2720	0.64	0.59	2.23	2.41	6.75	6.36	1.47	4.84	26.32	30.40
13	Sa	4,124	3.6	139.0			2530	2630	0.75	0.81	2.15	2.35	6.85	6.23	1.61	4.56	26.20	30.36
14	Su	3,629	3.4	127.7			2440	2690	0.89	0.76	2.34	2.36	6.71	6.21	1.75	4.56	27.60	31.63
15	M	9,241	8.2	134.8	7.4	7.1	2280	2610	0.92	0.81	2.13	2.49	6.46	6.11	1.75	3.43	28.14	32.28
16	T	7,272	6.3	137.8	7.1	7.1	2360	2560	0.87	0.68	2.20	2.54	6.50	6.11	1.61	4.98	26.59	31.59
17	W	10,847	9.0	145.2	7.1	7.1	2340	2530	0.72	0.66	2.06	2.45	6.60	6.28	1.61	4.56	26.03	30.85
18	Th	9,364	7.8	143.7	7.1	7.1	2310	2420	0.79	0.75	2.01	2.38	6.70	6.25	1.61	4.56	26.90	31.62
19	F	7,898	6.8	138.3	7.3		2570	2520	0.73	0.72	2.09	2.40	6.71	6.31	1.61	4.56	26.92	31.59
20	Sa	3,780	3.6	125.6			2430	2540	0.69	0.66	2.19	2.47	6.68	6.22	2.17	4.56	27.58	31.58
21	Su	2,430	2.8	105.9			2370	2400	0.72	0.73	2.28	2.61	6.63	6.07	1.75	4.70	27.61	32.53
22	M	8,185	7.3	134.7	7.5	7.3	2300	2340	0.80	0.86	2.36	2.68	6.54	5.90	1.75	4.77	27.51	32.62
23	T	9,658	8.5	136.3	7.3	7.1	2440	2400	0.74	0.81	2.16	2.65	6.58	6.14	1.61	4.56	26.69	31.65
24	W	9,380	8.4	133.9	7.2	7.1	2370	2480	0.65	0.72	2.11	2.53	6.68	6.19	1.54	4.42	26.17	30.85
25	Th	8,843	7.8	135.2	7.3	7.2	2500	2740	0.48	0.61	2.11	2.53	6.79	6.38	1.61	4.42	22.38	30.25
26	F	6,810	5.8	139.8	7.3	7.1	2480	2580	0.55	0.69	2.12		6.89	6.36	1.61		25.62	30.03
27	Sa	4,180	4.5	111.0			2780	2870	0.55	0.74	2.06	2.45	6.70	6.29	1.61	4.14	25.71	30.19
28	Su	3,888	4.8	97.0			2440	2820	0.71	0.90	2.23	2.66	6.79	6.23	1.47	4.42	25.85	30.98
29	M	10,588	9.7	130.8	7.5	7.2	2430	2650	0.81	1.07	2.30	2.84	6.72	6.04	1.61	4.14	26.01	31.61
30	T	8,585	7.7	134.5	7.1	7.0	2620	2510	0.73	1.06	2.30	2.90	6.75	5.86	1.68	5.26	25.81	32.12
31																		

PLANT OPERATIONAL DATA

JULY 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor					Return Sludge (Dry Basis)									
				East Plant	pH		Suspended Solids mg/1		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/1	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	W	9,353	8.3	135.0	7.1	7.0	2590	2580	0.68	1.03	2.31	2.93	6.85	5.94	1.61	4.98	26.13	32.14
2	Th	8,436	7.6	130.4	7.0	7.0	2610	2400	0.63	0.92	2.29	2.94	6.88	6.26	1.68	5.12	25.59	31.58
3	F	6,802	6.5	124.8	7.1	7.0	2700	2470	0.51	0.84	2.34	2.92	6.96	6.23	1.68	4.98	25.57	31.30
4	Sa	5,783	7.2	95.9			2950	2570	0.51	0.87	2.42	2.91	7.05	6.25	1.75	5.26	26.08	31.44
5	Su	5,233	7.1	88.6			2780	2680	0.75	1.10	2.53	3.02	6.81	6.00	1.75	5.40	26.13	31.55
6	M	8,595	8.4	123.0	7.4	7.0	2710	2680	0.84	1.24	2.89	3.21	6.74	5.84	1.89	5.68	27.91	33.89
7	T	9,193	7.9	140.3	7.3	7.0	2850	2840	0.78	1.22	2.75	3.24	6.44	5.62	1.89	5.54	27.68	34.20
8	W	8,433	7.4	137.2	7.2	7.0	2910	3010	0.86	1.17	2.41	3.01	6.42	5.74	1.75	5.26	27.92	33.76
9	Th	9,929	8.6	138.5	7.1	6.9	3100	3080	0.64	1.12	2.41	2.96	6.54	5.77	1.61	4.98	27.90	33.27
10	F	6,412	5.5	138.7	7.2	6.9	3130	3240	0.65	1.07	2.41	2.94	6.63	5.81	1.75	4.98	28.05	33.57
11	Sa			122.7			2950	3130	0.76	1.12	2.44	2.95	6.88	6.05	1.89	5.26	28.21	33.79
12	Su			112.8			2770	2870	0.86	1.23	2.56	3.14	6.58	5.77	2.17	5.40	28.72	34.88
13	M	7,996	6.5	147.7	7.3	6.9	2450	2650	1.01	1.38	2.58	3.19	6.70	5.67	2.03	5.12	28.63	35.09
14	T	9,073	7.8	139.3	7.3	7.0	2440	2890	1.01	1.32	2.45	3.10	6.54	5.67	2.03	4.98	28.79	35.16
15	W	8,208	7.2	136.3	7.1	6.7	2490	2640	1.01	1.21	2.31	2.88	6.14	5.59	1.89	4.70	29.81	35.65
16	Th	8,266	7.2	137.0	7.2	6.9	2690	2700	0.92	1.22	2.33	2.79	6.43	5.90	1.89	4.70	29.48	35.42
17	F	5,831	4.9	143.6	7.0	7.0	2850	2690	0.86	1.11	2.35	2.79	6.65	5.93	1.75	4.70	28.63	34.09
18	Sa	4,018	3.8	125.4			2840	2760	0.89	1.13	2.33	2.68	6.70	6.12	1.89	4.56	29.21	33.86
19	Su	3,953	3.8	123.7			2540	2330	1.04	1.15	2.44	2.74	6.70	6.04	1.89	4.70	29.54	34.02
20	M	4,711	4.4	127.8	7.2	6.9	2330	2190	1.06	1.16	2.40	2.83	6.43	5.91	2.03	4.42	29.61	33.85
21	T			131.0			2130	2230	1.02	1.14	2.37	2.85	6.51	6.02	1.89	4.42	28.34	32.90
22	W	8,138	7.4	131.9			2210	2460	0.89	1.13	2.25	2.74	6.63	5.91	1.75	4.00	27.38	31.51
23	Th	9,417	8.4	134.7			2470	2510	0.81	0.99	2.32	2.65	6.60	6.28	1.75	3.85	27.77	30.53
24	F	6,176	5.5	134.7			2610	2670	0.76	1.00	2.25	2.64	6.92	6.42	1.75	4.14	26.66	30.57
25	Sa	5,590	5.5	122.8			2550	2710	0.92	1.02	2.35	2.71	6.74	6.25	1.75	4.00	27.24	31.26
26	Su	5,735	6.3	108.8			2450	2480	0.96	1.08	2.51	2.92	6.67	6.16	1.89	4.56	27.44	32.06
27	M	8,229	7.1	138.9	6.8	6.7	2080	2150	1.03	0.98	2.46	2.95	6.54	6.02	2.03	4.75	27.37	32.43
28	T	7,972	6.7	143.1	7.0	7.0	2250	2260	1.03	1.27	2.27	2.74	6.42	6.01	2.03	4.56	27.04	31.47
29	W	8,989	7.7	140.3	7.0	6.9	2420	2270	0.98	1.09	2.25	2.63	6.57	6.15	1.75	4.14	26.94	31.43
30	Th	8,159	6.8	143.3	7.1	6.9	2480	2320	1.05	1.08	2.16	2.47	6.47	6.32	1.68	4.14	26.51	29.99
31	F	8,342	7.0	142.9	7.0	7.1	2690	2680	1.04	1.15	2.20	2.43	6.78	6.28	1.89	4.42	27.13	30.67

PLANT OPERATIONAL DATA AUGUST 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor							Return Sludge (Dry Basis)							
				East Plant	pH		Suspended Solids mg/l		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/l	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	Sa	4,154	4.1	121.1			2710	2790	1.07	1.16	2.27	2.44	6.42	6.08	1.96	4.56	29.00	32.27
2	Su	5,069	6.1	100.3	6.9	6.9	2500	2590	1.09	1.13	2.44	2.65	6.44	6.05	1.89	4.98	29.19	33.06
3	M	8,644	7.8	132.9			2310	2420	1.08	1.14	2.47	2.69	6.23	5.94	2.03	5.26	29.27	33.70
4	T	9,207	8.5	129.3	6.9	6.8	2190	2580	1.10	1.09	2.40	2.68	6.22	6.02	2.17	4.98	29.80	32.54
5	W	9,480	8.7	130.3	6.9	6.8	2470	2760	0.99	0.99	2.30	2.61	6.64	6.09	1.75	4.84	27.30	32.02
6	Th	9,873	9.1	130.1	6.7	6.9	2730	2930	0.94	1.05	2.37	2.43	6.50	6.37	2.87	4.28	28.46	29.20
7	F	6,275	5.7	132.2	6.9	6.9	2870	3230	0.93	1.19	2.28	2.52	6.74	6.30	1.89	4.84	26.69	31.28
8	Sa	4,808	5.3	107.8			2810	3140	0.96	1.12	2.29	2.61	6.79	6.23	1.75	4.98	26.37	31.49
9	Su	5,056	6.3	95.6	6.8	6.8	2510	2920	1.10	1.40	2.47	2.81	6.70	6.07	1.89	5.40	27.21	32.21
10	M	8,175	7.5	131.3	6.8	6.8	2210	2700	1.03	1.20	2.80	2.98	6.47	5.97	2.03	5.68	27.85	33.21
11	T	7,503	6.7	133.7	6.8	6.7	2300	2680	1.15	1.29	2.43	2.91	6.54	5.88	1.75	5.26	26.39	32.96
12	W	8,712	7.8	133.7	7.0	6.9	2510	2630	1.09	1.31	2.35	2.85	6.56	6.00	1.82	5.19	26.16	32.03
13	Th	8,758	7.8	135.3	7.0	6.8	2630	2660	1.05	1.26	2.37	2.58	6.51	6.33	1.75	4.98	26.20	30.91
14	F	6,853	6.0	137.5			2900	2810	1.03	1.28	2.32	2.68	6.82	6.29	1.75	5.12	26.05	31.25
15	Sa	5,800	6.0	115.0			2490	2770	1.11	1.26	2.49	2.74	6.82	6.29	1.96	5.33	26.78	31.76
16	Su	4,064	4.9	99.1	6.9	7.0	2160	2760	1.04	1.26	2.67	2.91	6.61	6.14	2.03	5.54	27.78	32.96
17	M	8,986	8.2	132.1	7.1		1810	2520	1.23	1.41	2.69	3.02	6.46	5.88	2.17	5.54	27.37	33.05
18	T	10,467	9.0	138.7	7.0	6.8	1980	2520	1.19	1.39	2.41	2.90	6.36	5.98	2.17	5.54	26.33	32.11
19	W	9,142	8.0	136.9	6.9	7.0	1930	2420	1.06	1.35	2.27	2.59	6.42	5.76	2.03	4.98	26.00	31.40
20	Th	9,184	8.5	129.3	7.0	7.0	2290	2370	1.08	1.28	2.37	2.58	6.60	6.18	2.17	5.12	26.27	31.12
21	F	6,361	5.9	129.7	7.0	6.9	2610	2760	0.88	1.23	2.40	2.55	6.75	6.29	2.27	5.12	26.20	30.74
22	Sa	4,210	4.5	111.1			2260	2380	0.90	1.20	2.53	2.65	6.88	5.98	1.89	4.98	26.05	30.41
23	Su	2,419	3.2	92.0	7.1	6.9	2070	2240	1.06	1.35	2.81	2.94	6.95	6.30	2.17	5.26	26.78	31.37
24	M	9,966	9.3	128.9	7.1	6.9	1430	2080	1.27	1.50	2.69	2.93	6.67	6.08	2.03	5.33	26.44	31.56
25	T	8,528	7.9	129.4	7.1	6.8	1680	2130	1.39	1.34	2.30	2.89	6.61	6.09	1.61	5.12	24.97	30.83
26	W	8,838	8.2	129.2	7.0	6.9	2220	2300	1.11	1.13	2.17	2.68	6.89	6.29	1.47	4.98	24.38	29.86
27	Th	8,404	7.6	132.3			2490	2420	0.96	0.99	2.22	2.50	6.99	6.29	1.75	4.14	24.83	28.75
28	F	6,114	5.5	134.3			2360	2410	0.94	1.08	2.17	2.51	6.98	6.30	1.61	4.75	24.69	29.35
29	Sa	5,887	6.1	116.5			2490	2780	0.95	1.01	2.20	2.52	6.82	6.36	1.68	4.70	26.27	30.32
30	Su	4,859	5.7	102.3			2210	2360	1.02	1.15	2.52	2.66	6.71	6.12	1.89	5.19	27.98	32.47
31	M	7,726	7.3	126.3	7.2	6.9	2070	2200	1.12	1.19	2.64	2.82	6.51	5.91	1.89	5.47	27.98	32.82

PLANT OPERATIONAL DATA

SEPTEMBER 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor					Return Sludge (Dry Basis)									
				East Plant	pH		Suspended Solids mg/1		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/1	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	T	8,035	7.5	127.7	7.2	6.9	2220	2310	1.15	1.26	2.41	2.71	6.51	6.04	1.62	4.99	26.48	31.20
2	W	6,968	6.0	138.7	7.1	6.9	2390	2440	1.09	1.19	2.32	2.58	6.68	6.19	1.62	4.64	25.70	30.17
3	Th	7,934	7.1	134.8	7.1	7.0	2310	2260	1.02	1.11	2.23	2.51	6.70	6.05	1.62	4.36	26.26	30.66
4	F	8,405	7.3	137.6	7.5	7.3	2360	2280	1.03	1.21	2.18	2.47	6.71	6.01	1.76	4.57	26.22	30.81
5	Sa	8,828	9.8	108.1			2480	2500	0.91	1.13	2.40	2.61	6.57	5.87	1.76	4.78	26.81	31.39
6	Su	10,206	9.4	130.3			2030	2420	1.06	1.29	2.64	2.84	6.56	5.97	1.90	5.69	27.82	33.13
7	M	9,331	9.4	118.8			1810	2470	1.15	1.40	2.55	2.94	6.19	5.27	2.18	6.40	30.09	36.47
8	T	6,394	5.8	131.9			1780	2240	1.34	1.33	2.49	2.88	6.16	5.41	2.04	6.12	28.65	35.18
9	W	7,603	6.5	141.1			2310	2320	1.21	1.33	2.27	2.65	6.30	5.80	2.04	5.55	27.24	32.79
10	Th	7,296	8.7	100.1	7.1	7.2	2500	2500	1.15	1.15	2.22	2.52	6.47	5.97	1.90	5.13	26.68	32.20
11	F	8,944	7.7	139.7	7.1	6.9	2650	2550	1.03	1.16	2.19	2.46	6.63	6.11	1.76	4.85	26.17	30.98
12	Sa	6,055	5.7	127.4			2550	2510	0.98	1.08	2.30	2.44	6.71	6.15	1.76	4.78	26.17	30.80
13	Su	6,178	6.2	119.4	7.1	6.9	2420	2520	0.99	1.17	2.41	2.59	6.61	6.02	1.90	5.27	26.82	31.98
14	M	7,022	5.8	145.5	7.0	6.9	2010	2440	1.00	1.05	2.45	2.71	6.61	6.08	1.90	5.69	26.28	31.83
15	T	8,482	7.1	142.3	7.1	6.9	2140	2380	1.05	1.15	2.33	2.62	6.57	5.95	1.83	5.20	26.80	32.01
16	W	7,085	5.7	150.0	7.3	7.2	2250	2370	0.98	1.26	2.50	2.12	6.39	5.98	1.76	5.20	26.61	32.19
17	Th	7,114	6.0	141.3			2370	2380	0.99	1.12	2.16	2.40	6.47	5.91	1.76	4.92	26.60	31.47
18	F	7,020	6.0	139.3	7.4	7.2	2260	2470	0.95	1.06	2.08	2.42	6.86	6.23	1.76	4.85	26.19	31.58
19	Sa	8,190	8.2	119.2			2480	2640	1.01	1.12	2.21	2.50	6.88	6.21	1.83	4.85	25.82	31.00
20	Su	8,100	8.9	109.2			1950	2410	0.97	1.12	2.46	2.71	6.88	6.16	1.97	5.27	25.95	31.54
21	M	7,774	6.5	142.3			1780	2240	0.91	1.12	2.12	2.47	6.77	6.01	1.90	5.62	25.77	32.06
22	T	7,960	6.8	140.1	7.2	7.0	2130	2430	0.89	1.19	2.30	2.73	6.46	6.08	1.76	5.27	25.12	31.05
23	W	6,392	5.1	149.1	7.3	7.2	2400	2840	0.77	1.10	2.16	2.58	6.82	6.25	1.90	4.85	24.97	30.19
24	Th	4,954	4.0	150.0	7.2	7.0	1920	2570	0.86	1.13	2.10	2.41	6.68	6.18	1.69	5.55	26.97	31.30
25	F	4,118	3.1	159.7	7.2	7.0	2040	2650	0.82	1.16	2.03	2.37	6.74	6.14	1.69	5.13	27.01	31.46
26	Sa	3,966	3.6	131.1			2090	2570	0.83	1.16	2.21	2.48	6.74	6.22	1.97	4.43	27.47	31.65
27	Su	6,579	7.0	112.7			2100	2320	0.82	1.27	2.46	2.69	6.74	6.00	2.04	4.71	27.95	32.17
28	M	11,610	10.4	133.9	7.3	7.0	1940	2140	0.85	1.29	2.42	2.79	6.60	5.94	2.04	5.20	27.29	32.30
29	T	7,525	6.7	134.6	7.0	6.9	2130	2210	0.93	1.31	2.33	2.71	6.57	5.90	1.90	4.99	26.37	31.30
30	W	6,739	6.0	134.6	7.1	6.9	2410	2360	0.88	1.13	2.22	2.63	6.70	6.21	1.76	4.57	25.61	30.04
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PLANT OPERATIONAL DATA OCTOBER 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor							Return Sludge (Dry Basis)							
				East Plant	pH		Suspended Solids mg/1		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/1	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	Th	6,653	5.9	135.2	7.0	6.9	2770	2690	0.84	1.09	2.18	2.57	6.81	6.16	1.69	4.29	25.65	29.97
2	F	7,109	6.2	138.0	7.2	7.1	2460	2720	0.84	1.01	2.18	2.51	6.75	6.25	1.76	4.29	26.09	30.08
3	Sa	6,183	6.9	107.4	7.1	6.9	2440	2800	0.91	0.84	2.27	2.54	6.88	6.32	1.69	4.36	25.96	30.24
4	Su	8,191	10.0	98.0			2240	2900	0.97	1.17	2.51	2.77	6.84	6.18	1.97	4.85	26.10	30.57
5	M	8,690	7.9	131.6	7.2	7.0	1960	2580	1.05	1.27	2.47	2.87	6.58	6.09	2.04	5.27	25.87	31.41
6	T	5,792	5.0	138.3	7.0	6.9	2500	2570	0.97	1.19	2.33	2.82	6.49	6.08	2.04	5.20	25.23	30.66
7	W	9,384	8.0	140.0	7.1	6.9	2480	2550	0.84	0.97	2.30	2.70	6.70	6.26	1.97	4.71	25.24	29.67
8	Th	4,765	4.0	141.2	7.1	7.0	2590	2530	0.79	1.04	2.25	2.59	6.77	6.36	1.76	4.50	25.25	29.42
9	F	7,464	6.6	135.2	7.1	7.0	2710	2690	0.64	0.85	2.41	2.53	6.88	6.44	1.62	4.15	25.12	29.08
10	Sa	6,614	6.9	115.6			2690	2640	0.79	0.81	2.28	2.59	6.93	6.61	1.83	4.43	25.60	28.90
11	Su	12,940	14.7	105.3			2430	2570	0.85	0.70	2.57	2.74	6.84	6.30	1.90	4.85	25.95	30.20
12	M	11,303	10.3	131.7	7.3	7.1	2170	2460	0.93	0.93	2.67	2.85	6.68	6.12	1.97	5.41	25.88	30.96
13	T	8,909	8.0	133.6	7.2	7.1	2270	2420	0.93	0.98	2.46	2.78	6.60	6.14	1.76	5.13	25.06	30.09
14	W	5,343	5.0	127.2	7.3	7.2	2350	2520	0.89	0.80	2.20	2.66	6.77	6.28	1.76	4.71	23.84	28.58
15	Th	6,270	5.8	130.5	7.1	7.0	2740	2660	0.62	0.77	2.23	2.60	6.71	6.36	1.76	4.50	23.89	28.01
16	F	7,486	7.3	123.0	7.2	7.1	2620	2740	0.52	0.74								
17	Sa	2,776	3.2	103.8	7.0	6.9	2620	2880	0.50	0.68	2.21	2.53	6.91	6.58	1.76	4.15	24.42	27.91
18	Su	2,844	3.5	96.8	7.1	7.0	2360	2810	0.66	0.83	2.50	2.78	6.98	6.51	1.90	4.43	25.09	29.07
19	M	6,892	6.6	124.3	7.3	7.1	2240	2640	0.92	1.01	2.58	2.89	6.79	6.33	1.76	4.36	25.16	29.13
20	T	6,859	6.2	133.0	7.1	7.0	2580	2740	1.00	1.08	2.36	2.75	6.68	6.35	1.76	4.08	24.49	28.66
21	W	4,987	4.6	131.4	7.0	7.0	2940	2900	0.81	0.96	2.22	2.63	6.68	6.39	1.76	4.15	24.66	28.52
22	Th	2,381	2.3	126.9	7.0	7.0	3230	3050	0.71	0.80	2.20		6.74	6.42	1.83	3.80	24.77	28.57
23	F	5,741	5.2	131.4	7.0	7.0	3110	3110	0.69	0.69	2.11	2.51	6.84	6.54	1.83	3.02	24.49	28.33
24	Sa	3,312	3.7	107.1			3090	3090	0.70	0.99	2.19		6.86	6.53	1.69	3.80	25.02	28.55
25	Su	4,752	6.5	87.7			2670	3070	0.92	1.05	2.44	2.78	6.88	6.35	1.76	4.29	24.29	29.64
26	M	9,000	9.1	119.2	7.2	7.0	2410	2770	1.01	1.18	2.40	2.89	6.65	6.18	2.04	4.57	25.17	30.39
27	T	5,640	5.0	135.6	7.0	6.9	2610	2830	0.99	1.14	2.27	2.76	6.65	6.18	1.76	4.71	24.30	29.49
28	W	6,291	5.4	127.2	7.1	6.8	2600	2780	1.01	1.20	2.15	2.68	6.71	6.29	1.76	4.71	25.17	30.49
29	Th	7,137	6.7	128.5	7.1	7.0	2790	2970	1.09	1.24	2.30	2.88	6.64	6.02	1.76	4.57	25.42	30.81
30	F	912	0.8	136.9	7.0	7.0	2840	3160	1.04	1.23	2.26	2.75	6.77	6.28	1.76	4.08	25.26	30.43
31	Sa	6,040	6.2	116.1			2710	3130	1.10	1.24	2.27	2.75	6.82	6.21	1.69	4.08	25.36	30.05

PLANT OPERATIONAL DATA NOVEMBER 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor							Return Sludge (Dry Basis)							
				East Plant	pH		Suspended Solids mg/1		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/1	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	Su	4,351	5.2	100.3			2520	3170	1.12	1.19	2.46	2.90	6.84	6.26	1.90	4.57	25.46	30.90
2	M	11,448	10.5	130.2	7.2	7.0	2220	2660	1.03	1.27	2.58	2.97	6.77	6.05	1.83	4.92	25.33	31.36
3	T	8,813	7.6	138.5			2680	2680	0.98	1.28	2.36	2.74	6.67	6.12	1.83	4.85	24.66	30.44
4	W	11,225	9.5	142.0			2470	2510	1.01	1.25	2.30	2.62	6.67	6.18	1.83	4.71	24.45	29.53
5	Th	11,340	9.7	139.8	7.1	7.0	2800	2650	0.95	1.12	2.15	2.54	6.68	6.09	1.83	4.64	24.27	29.25
6	F	6,500	5.7	137.2	7.0	6.9	3080	3010	1.05	1.19	2.15	2.52	6.74	6.30	1.90	4.71	24.38	29.46
7	Sa	5,590	5.8	114.6			2890	3090	0.94	1.12	2.25	2.47	6.98	6.35	1.90	4.57	24.79	28.92
8	Su	4,432	5.0	106.6			2630	3060	1.04	1.20	2.47	2.62	6.88	6.36	1.97	4.92	25.51	29.63
9	M	6,048	5.2	138.8	7.2	7.0	2360	2680	0.94	1.19	2.45	2.70	6.70	6.18	2.25	4.92	25.52	30.30
10	T	7,839	7.0	134.9	7.2	7.0	2810	2770	1.10	1.20	2.33	2.60	6.53	6.16	1.83	4.85	25.44	29.55
11	W	6,293	5.7	133.3			2830	2930	1.04	1.18	2.20	2.53	6.68	6.22	1.97	4.79	25.08	29.29
12	Th	10,834	9.9	130.8	7.1	6.9	3010	2930	0.92	1.15	2.09	2.47	6.78	6.43	1.83	4.51	24.96	29.08
13	F	7,680	7.0	130.8	7.0	6.9	3150	2870	0.77	1.03	2.14	2.38	6.33	6.13	1.69	4.51	24.58	28.04
14	Sa	5,558	5.4	123.0	7.1	7.1	3010	2960	0.76	1.04	2.17	2.40	7.00	6.49	1.69	4.65	24.52	28.90
15	Su	8,457	9.3	108.5			2920	3080	0.90	1.01	2.37	2.56	7.03	6.44	1.83	5.07	24.73	28.94
16	M	11,532	10.2	135.9	7.2	7.1	2850	2880	0.91	1.04	2.46	2.67	6.98	6.35	1.76	5.35	24.80	29.64
17	T	5,421	4.7	138.1			3010	2930	0.78	1.18	2.34	2.58	6.79	6.29	1.83	4.93	24.32	28.78
18	W	7,880	6.9	136.2	7.0	7.0	3210	3190	0.76	1.00	2.26	2.54	6.88	6.42	1.76	4.86	24.40	28.69
19	Th	8,258	6.6	149.0	6.9	6.9	3200	3290	0.55	0.98	2.23	2.49	6.70	6.30	1.90	4.57	24.94	29.12
20	F	6,240	5.0	148.4	7.0	7.0	2900	3120	0.76	1.06	2.20	2.43	6.77	6.30	1.97	4.72	25.49	29.36
21	Sa	2,871	2.8	120.9			2960	3400	1.06	1.24	2.24	2.46	6.91	6.40	1.97	4.86	25.69	29.61
22	Su	3,514	4.2	100.3			2880	3260	0.87	1.06	2.41	2.57	6.93	6.42	2.04	4.79	25.75	29.73
23	M	7,711	7.2	129.3	7.1	6.9	2710	3160	0.99	1.13	2.43	2.67	6.81	6.32	2.11	4.93	25.49	29.99
24	T	5,913	5.4	132.9	7.2	7.0	2860	3070	0.92	1.13	2.20	2.61	6.72	5.88	1.97	4.72	24.37	29.45
25	W	8,837	7.8	135.9	7.2	7.1	2860	3030	0.82	1.08	2.16	2.55	6.95	6.51	1.97	4.37	23.91	27.98
26	Th	2,997	3.2	111.3			3030	3260	0.75	1.07	2.31	2.58	6.99	6.46	1.83	4.51	24.24	28.66
27	F	2,074	2.0	124.9	7.3	7.2	2610	3020	0.87	1.14	2.40	2.68	7.09	6.51	1.83	4.16	24.26	28.61
28	Sa	2,600	3.0	104.9			2560		1.00	1.13	2.34		7.06		1.83		23.93	
29	Su	3,370	4.0	100.8			2480	2920	0.94	1.20	2.52	2.95	7.03	6.35	2.25	4.65	24.23	29.08
30	M	7,774	7.2	128.9	7.4	7.1	2330	2710	1.05	1.29	2.48	2.99	6.93	6.36	1.83	4.65	23.77	29.11
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PLANT OPERATIONAL DATA DECEMBER 1970

Date	Day	Iron Addition to East Plant Mixed Liquor		Mixed Liquor							Return Sludge (Dry Basis)							
				East Plant	pH		Suspended Solids mg/l		SDI		% Total P		% Total N		% Total Fe		% Total Ash	
		lbs/day	mg/l	MGD	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP	WP	EP
1	T	6,566	6.0	130.6	7.2	7.1	2500	2680	0.83	1.13	2.21	2.78	6.79	6.28	1.83	4.09	23.42	28.29
2	W	10,268	9.1	136.0	7.1	7.0	2640	2800	0.68	1.06	2.12	2.59	6.92	6.36	1.62	4.16	23.08	27.57
3	Th	11,035	9.4	140.0	7.1	7.0	2610	2740	0.65	0.93	2.05	2.47	6.86	6.57	1.55	4.16	23.17	27.58
4	F	8,052	7.3	132.4	7.0	7.0	2690	2940	0.58	0.94	2.05	2.39	6.99	6.44	1.62	4.44	23.30	28.20
5	Sa	6,018	5.9	121.3			2760	2940	0.54	0.81	2.06	2.39	7.14	6.63	1.62	4.37	22.82	27.54
6	Su	6,739	7.1	113.9			2530	2810	0.73	0.88	2.19	2.50	7.26	6.58	1.76	4.65	22.93	27.98
7	M	10,088	8.8	137.0	7.3	7.1	2480	2680	0.77	0.91	2.27	2.61	7.09	6.12	1.76	4.86	23.02	28.07
8	T	8,082	7.1	136.1	7.2	7.0	2560	2670	0.78	0.85	2.15	2.53	7.03	6.42	1.76	4.72	22.80	27.73
9	W	11,624	10.4	134.2	7.2	7.1	2590	2830	0.76	0.77	2.12	2.45	6.63	6.47	1.62	4.37	22.96	27.27
10	Th	13,001	10.7	146.1	7.1	7.1	2780	2940	0.61	0.47	2.10	2.40	7.03	6.60	1.62	4.44	23.00	27.17
11	F	11,957	10.1	142.4	7.0	7.0	2690	2840	0.76	0.72	2.04	2.33	6.98	6.46	1.83	4.51	23.03	27.97
12	Sa	10,603	9.3	136.7			2900	2520	0.82	0.73	2.07	2.34	7.06	6.46	1.12	4.79	23.67	28.11
13	Su	6,486	6.5	120.0			2220	2720	0.85	0.79	2.25	2.41	7.07	6.44	1.69	5.64	23.29	28.55
14	M	4,695	4.3	131.4	7.1	7.0	2170	2690	0.95	0.93	2.29	2.53	6.98	6.32	1.69	5.35	23.07	28.85
15	T	5,045	4.4	137.4	7.2	7.2	2330	2800	0.86	0.87	2.08	2.46	6.53	6.40	1.97	4.79	22.78	28.13
16	W	13,818	11.6	143.2	7.0	6.9	2500	2720	0.89	0.91	2.00	2.37	6.84	6.44	1.41	4.65	22.78	27.40
17	Th	9,525	8.0	142.3			2610	2700	0.91	0.91	1.92	2.28	6.70	6.35	1.69	4.79	23.04	28.17
18	F	8,748	7.0	150.3	6.8	6.8	2670	2650	0.89	0.91	1.95	2.20	6.92	6.44	1.62	4.79	23.38	27.89
19	Sa	7,452	7.2	123.7			2550	2670	0.94	0.94	1.99	2.17	7.05	6.58	1.62	4.79	23.41	27.25
20	Su	4,061	4.4	110.6			2390	2750	0.92	0.90	2.13	2.31	7.10	6.56	1.90	5.28	23.84	28.20
21	M	9,698	8.7	133.4	6.9	6.9	2320	2710	0.95	0.94	2.16	2.40	6.86	6.46	1.97	5.49	23.67	28.46
22	T	7,920	6.8	139.0	6.9	6.9	2410	2770	0.99	0.98	2.08	2.34	6.71	6.42	1.83	5.14	23.87	28.52
23	W	7,661	7.0	132.0	6.9	6.9	2480	2840	0.96	0.88	1.98	2.35	6.74	6.58	1.76	4.86	23.87	28.01
24	Th	6,646	6.9	114.7	6.9	6.9	2770	3000	0.83	0.76	2.02	2.27	6.84	6.65	1.76	4.72	23.38	27.70
25	F	5,586	7.3	91.4			2570	2930	0.85	0.87	2.11	2.37	7.07	6.67	1.76	4.93	23.16	28.02
26	Sa	5,490	7.0	93.5			2420	2760	0.87	0.90	2.26	2.48	7.13	6.58	1.90	5.28	23.03	28.65
27	Su	4,980	6.0	98.7			2170	2420	0.93	1.02	2.33	2.61	6.96	6.50	2.04	5.64	23.12	29.00
28	M	5,760	5.6	124.3	7.1	7.1	2020	2310	1.00	1.06	2.26	2.66	6.60	6.29	2.04	5.49	23.05	28.94
29	T	7,398	7.0	126.4			2410	2600	0.97	1.00	2.06	2.49	6.60	6.29	1.76	4.86	22.80	27.78
30	W	6,662	6.4	124.3			2560	2760	0.90	1.03	2.00	2.36	6.70	6.37	1.62	4.44	23.06	27.28
31	Th	6,365	6.9	111.2			2940	2970	0.87	1.09	2.01	2.31	6.75	6.57	1.62	4.16	23.39	26.74

PLANT OPERATIONAL DATA JANUARY 1970

Date	Day	Kjeldahl Nitrogen mg/l as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids			
										1968	1969	1970.	
1	Th	35.6	16.7	19.0	207.3	6.63	24.82	3.1	1.49	229.50	238.81	278.74	.03
2	F	38.2	21.1	19.9	179.8	6.96	25.41	3.1	1.50		240.61	264.56	Trace
3	Sa	33.0	14.7	15.8	182.0	6.84	24.91	3.1	1.66	54.91	220.89	265.32	.01
4	Su	31.4	16.2	28.6	92.7	6.87	24.99	3.1	1.65	202.15	220.57		Trace
5	M	39.3	20.0	20.9						218.27	234.39		
6	T	37.5	24.5	12.7	10.6	6.85	25.08	3.2	1.92	177.28			
7	W	34.7	13.7	12.6	171.2	6.66	24.24	3.1	1.51	183.16			Trace
8	Th	37.9	14.4	14.0	232.0	6.71	24.83	3.1	1.50	195.29	239.40	256.13	.03
9	F	36.8	13.4	17.4	220.5	6.76	24.85	3.1	1.45	212.62	211.46	257.56	Trace
10	Sa	33.7	12.5	14.6	227.5	6.71	25.11	3.1	1.42	217.36	285.31	250.95	
11	Su	31.9	17.9	20.7	215.0	6.71	26.12	3.1	1.39	222.40	204.67	270.46	.01
12	M	36.5	20.4	20.9	212.5	6.63	26.99	3.3	1.46	232.14	206.56	218.39	
13	T	37.4	13.3	15.0	225.3	6.43	27.47	3.3	1.59	231.29	219.10	222.59	Trace
14	W	37.2	13.4	11.2	234.2	6.36	27.12	3.3	1.58	208.56	216.06	207.52	.05
15	Th	36.3	16.2	12.2	223.7	6.35	26.72	3.2	1.54	221.16	219.98	227.05	
16	F	35.8	16.5	12.2	224.2	6.37	27.10	3.2	1.51	247.73	199.69	215.06	Trace
17	Sa	34.4	16.1	14.1	230.5	6.42	27.77	3.2	1.46	214.69	199.33	210.77	.09
18	Su	31.8	19.3	22.5	216.2	6.41	27.93	3.2	1.45	216.76	206.74	225.54	Trace
19	M	33.6	20.4	21.0	213.2	6.65	27.57	3.2	1.45	216.78	209.88	228.39	
20	T	35.4	14.8	15.4	238.1	6.30	27.08	3.2	1.63	207.91	197.55	204.17	Trace
21	W	35.1	13.2	12.9	235.0	6.08	27.28	3.2	1.67	227.22	223.77	212.98	
22	Th	34.6	12.2	12.7	228.5	6.14	27.00	3.2	1.59	226.69	218.19	202.12	.01
23	F	36.3	15.5	12.6	223.0	6.26	27.13	3.2	1.36	193.84	215.13	208.39	Trace
24	Sa	33.3	14.7	12.5	210.0	6.26	26.42	3.2	1.35	209.13	183.03	207.21	Trace
25	Su	32.1	18.5	17.6	189.1	6.42	27.48	3.2	1.27	213.54	186.47	225.47	.01
26	M	34.4	20.6	23.0	201.9	6.48	27.50	3.2	1.32	218.43	205.23	230.85	.08
27	T	34.2	17.5	15.8	210.3	6.22	27.60	3.2	1.44	224.35	242.09	223.61	.02
28	W	29.0	13.2	13.6	205.1	6.00	27.53	3.1	1.53	189.40	233.44	213.90	.03
29	Th	34.6	13.4	11.8	217.9	5.84	28.35	3.1	1.55	193.08	229.41	213.07	.04
30	F	33.3	14.4	11.6	216.4	5.91	27.76	3.1	1.48	188.69	214.93	219.17	Trace
31	Sa	31.5	14.4	13.4	222.1	6.05	27.61	3.1	1.48	203.27	217.29	216.40	

PLANT OPERATIONAL DATA FEBRUARY 1970

Date	Day	Kjeldahl Nitrogen mg/l as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids 1968	1969	1970	
1	Su	27.2	15.8	18.5	225.1	6.16	27.62	3.1	1.50	201.89	220.36	210.37	Trace
2	M	31.8	16.1	18.1	216.9	6.06	29.20	3.1	1.60	199.33	216.98	216.97	Trace
3	T	32.9	12.9	15.5	249.3	5.78	28.60	3.1	1.70	240.71	224.93	203.72	
4	W	33.7	11.9	11.6	197.0	5.74	27.61	3.1	1.61	272.52	202.08	248.23	.04
5	Th	35.4	12.5	11.8	212.7	5.93	27.67	3.1	1.54	206.46	203.56	231.58	
6	F	34.7	11.5	14.0	206.8	6.08	26.71	3.2	1.45	236.27	203.40	229.28	
7	Sa	35.3	12.5	14.8	229.0	6.23	25.69	3.2	1.42	222.29	179.66	223.28	
8	Su	31.1	19.6	18.2	218.2	6.42	26.48	3.2	1.40	238.08	201.85	237.92	.03
9	M	34.9	19.6	18.8	220.0	6.33	27.12	3.2	1.41	234.14	211.00	233.35	Trace
10	T	34.6	14.3	13.4	220.2	6.15	26.96	3.1	1.41	226.15	228.10	222.91	Trace
11	W	36.7	11.2	13.3	201.3	6.08	27.67	3.1	1.39	213.88	224.53	206.09	Trace
12	Th	33.7	13.3	12.3	239.0	6.14	26.95	3.1	1.42	209.86	198.29	210.65	.01
13	F	33.5	11.3	12.6	213.5	6.25	27.38	3.2	1.48	200.64	192.34	218.51	
14	Sa	32.3	12.7	12.5	234.5	6.30	27.24	3.0	1.29	202.48	184.58	200.34	Trace
15	Su	32.9	18.2	17.9	211.0	6.51	27.91	3.0	1.37	207.71	183.74	233.39	Trace
16	M	32.8	21.6	25.1	224.5	6.38	27.23	3.1	1.55	209.21	189.29	254.75	
17	T	32.9	15.7	15.5	218.1	6.05	27.05	3.1	1.62	206.30	209.11	231.62	
18	W	33.3	11.9	12.7	217.8	6.03	27.36	3.1	1.45	203.37	209.51	249.04	.05
19	Th	34.2	11.9	11.6	231.1	6.08	26.71	3.1	1.42	193.68	205.96	241.74	Trace
20	F	32.6	11.8	11.1	224.6	6.19	26.42	3.1	1.35	202.73	207.44	238.83	
21	Sa	31.5	12.6	11.1	210.0	6.16	26.72	3.1	1.37	218.53	206.76	246.38	
22	Su	28.6	18.1	16.0	203.8	6.19	27.71	3.1	1.35	229.02	223.72	272.15	
23	M	32.8	19.5	18.1	219.7	6.12	28.38	3.1	1.37	196.01	212.87	246.63	
24	T	32.5	14.4	14.1	227.0	5.90	28.30	3.1	1.41	193.37	214.35	231.56	
25	W	34.4	10.5	11.8	226.6	5.91	27.82	3.1	1.38	190.87	215.88	224.70	Trace
26	Th	34.5	10.2	10.8	212.5	5.98	27.29	3.1	1.33	246.36	219.66	214.90	Trace
27	F	36.1	11.2	11.3	217.0	6.05	27.92	3.1	1.27	184.91	184.85	222.71	Trace
28	Sa	31.8	12.0	10.9	215.0	6.02	27.50	3.1	1.21	194.12	202.26	237.79	Trace
29										202.41			
30													
31													

PLANT OPERATIONAL DATA

MARCH 1970

Date	Day	Kjeldahl Nitrogen mg/l as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids 1968	1969	1970	
1	Su	28.0	18.1	17.5	207.5	6.19	27.56	3.1	1.27	224.01	210.58	251.77	
2	M	32.9	20.3	17.9	213.0	6.17	28.09	3.1	1.37	228.04	207.46	232.21	
3	T	24.5	12.0	11.3	224.7	5.80	28.18	3.1	1.50	209.25	202.58	219.69	
4	W	29.8	9.7	10.8	241.3	5.37	29.57	3.1	1.65	217.03	192.91	224.09	
5	Th	30.7	8.1	9.4	220.7	5.41	29.25	3.1	1.49	219.39	182.93	234.42	
6	F	31.5	9.0	13.3	235.0	5.67	29.61	3.1	1.32	236.09	194.83	244.81	
7	Sa	30.5	8.8	10.8	232.0	5.87	28.19	3.1	1.27	236.64	182.85	241.22	Trace
8	Su	29.0	12.6	14.4	215.1	6.10	28.82	3.1	1.18	213.91	201.10	260.90	Trace
9	M	29.8	17.9	16.0	220.5	6.00	29.29	3.1	1.20	216.59	203.80	265.65	.17
10	T	31.5	11.1	9.4	224.8	5.86	29.50	3.1	1.29	220.99	248.17	249.43	
11	W	32.6	8.8	7.8	214.6	5.86	29.02	3.1	1.31	192.58	229.82	230.32	Trace
12	Th	33.6	9.8	8.3	210.3	5.93	28.67	3.1	1.23	198.04	205.02	233.66	
13	F	33.5	12.2	9.2	213.9	6.19	28.39	3.1	1.21	194.92	204.85	228.94	
14	Sa	29.5	11.5	9.1	197.5	6.29	27.22	3.1	1.20	225.72	216.27	264.61	Trace
15	Su	31.1	17.6	15.5	215.6	6.38	27.47	3.1	1.20	215.17	205.19	269.09	.01
16	M	33.5	19.6	18.9	206.5	6.29	28.16	3.1	1.40	234.67	219.82	247.21	
17	T	34.4	13.4	12.3	220.5	6.06	28.07	3.1	1.55	212.47	224.42	240.21	
18	W	33.3	14.6	9.7	206.6	6.00	28.36	3.1	1.50	193.75	241.45	245.77	
19	Th	27.2	7.8	8.0	205.5	6.12	28.30	3.1	1.42	206.80	219.32	236.41	
20	F	25.1	7.6	6.6	198.7	6.08	28.29	3.1	1.38	219.51	212.67	234.49	.42
21	Sa	26.6	9.2	7.0	201.5	6.04	28.48	3.1	1.39	221.40	208.36	237.09	.08
22	Su	28.0	16.2	12.9	200.5	6.19	29.35	3.1	1.39	210.88	210.96	250.05	
23	M	30.4	16.4	16.7	212.1	6.22	29.81	3.1	1.40	182.45	224.40	265.85	
24	T	30.7	12.5	10.2	203.7	6.10	29.59	3.2	1.46	171.41	239.24	257.36	Trace
25	W	29.4	8.3	7.7	210.1	6.01	28.96	3.2	1.46	176.80	219.76	220.83	Trace
26	Th	27.0	7.4	8.1	199.7	6.01	29.00	3.2	1.41	194.96	203.36	216.58	.03
27	F	28.8	6.7	7.1	207.4	6.14	29.04	3.2	1.35	177.66	220.24	207.41	.35
28	Sa	27.0	7.1	8.3	208.5	6.17	28.10	3.2	1.25	182.28	218.42	215.87	.05
29	Su	27.2	14.3	13.0	200.5	6.29	28.71	3.2	1.25	168.28	187.66	220.84	
30	M	31.2	18.2	16.4	202.1	6.37	29.37	3.2	1.33	194.79	186.67	237.46	Trace
31	T	29.4	10.1	9.2	210.8	6.11	28.48	3.4	1.51	203.73	155.91	210.31	

PLANT OPERATIONAL DATA

APRIL 1970

Date	Day	Kjeldahl Nitrogen mg/l as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids			
										1968	1969	1970	
1	W	28.3	8.1	8.1	208.5	6.13	28.68	3.4	1.47	188.47	181.69	179.42	.33
2	Th	21.7	3.9	5.6	192.7	6.08	28.34	3.4	1.39	201.43	192.00	174.81	.43
3	F	24.1	5.0	3.8	207.2	6.22	29.29	3.4	1.32	218.74	175.33	159.46	
4	Sa	26.9	5.9	5.3	200.3	6.23	28.67	3.3	1.24	222.46	173.53	183.21	
5	Su	24.2	10.1	12.5	208.5	6.30	28.59	3.2	1.18	210.75	189.63	197.41	.03
6	M	29.5	15.1	15.5	225.9	6.30	29.09	3.2	1.26	204.18	191.85	212.85	.07
7	T	28.7	10.8	10.2	204.9	6.10	29.31	3.2	1.35	215.84	200.89	207.52	
8	W	30.0	7.3	7.3	193.5	6.06	29.00	3.3	1.27	226.78	202.21	181.78	
9	Th	23.0	6.3	6.0	190.0	6.31	29.75	3.3	1.23	221.05	188.95	179.64	
10	F	31.8	7.7	5.9	204.0	6.44	28.84	3.2	1.21	204.63	174.76	180.95	
11	Sa	29.0	10.2	6.9	201.5	6.44	28.02	3.1	1.19	197.44	173.22	203.06	Trace
12	Su	30.0	17.2	13.2	209.5	6.54	28.41	3.1	1.17	199.88	172.71	197.45	.01
13	M	19.5	12.3	13.2	220.5	6.39	28.52	3.1	1.24	214.46	190.75	194.75	.99
14	T	24.6	6.2	7.3	210.5	5.95	29.29	3.2	1.32	217.45	194.21	178.16	.02
15	W	26.3	7.0	4.3	188.3	5.88	30.33	3.3	1.30	215.08	193.31	189.11	Trace
16	Th	26.0	7.0	4.3	209.2	6.06	29.50	3.3	1.22	223.88	206.64	198.91	.05
17	F	30.8	8.5	3.8	209.0	6.33	28.54	3.1	1.18	212.45	186.27	202.35	
18	Sa	29.4	10.1	5.7	203.0	6.42	28.20	3.1	1.17	197.13	195.22	201.32	
19	Su	21.4	14.4	11.5	207.0	6.40	29.77	3.4	1.24	200.23	194.32	183.94	.42
20	M	30.0	11.3	8.3	204.0	6.29	29.67	3.4	1.31	205.24	214.78	187.68	.02
21	T	28.8	7.6	5.0	215.0	6.13	29.13	3.4	1.35	179.73	229.47	195.69	Trace
22	W	28.6	4.9	4.3	199.0	6.17	29.11	3.4	1.31	198.33	234.99	182.89	.07
23	Th	29.7	5.5	4.1	196.5	6.16	28.53	3.2	1.28	210.61	208.94	199.20	
24	F	30.0	7.3	4.2	177.0	6.16	28.72	3.3	1.32	192.56	199.63	195.04	
25	Sa	29.8	5.6	5.0	150.5	6.38	28.72	3.3	1.30	206.30	213.45	200.42	
26	Su	25.3	10.6	9.2	181.5	6.48	28.79	3.3	1.26	227.86	233.37	205.34	
27	M	29.5	17.6	14.1	192.1	6.50	28.90	3.3	1.32	226.62	244.16	212.33	
28	T	28.6	10.4	7.6	199.5	6.35	29.12	3.3	1.45	231.15	208.26	202.71	
29	W	27.2	8.0	6.9	193.5	6.24	28.55	3.2	1.52	196.17	206.08	219.85	
30	Th	25.9	8.1	8.7	193.0	6.30	28.79	3.1	1.49	217.94	210.23	226.67	.27
31													

PLANT OPERATIONAL DATA

MAY 1970

Date	Day	Kjeldahl Nitrogen mg/1 as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids			
										1968	1969	1970.	
1	F	28.6	7.8	10.2	200.0	6.30	28.42	3.0	1.46	220.15	209.62	243.68	0.1
2	Sa	28.8	8.1	7.3	199.5	6.30	28.79	3.0	1.51	202.22	223.30	225.29	
3	Su	26.2	11.2	9.8	193.1	6.42	29.22	3.1	1.47	182.40	226.64	241.31	0.02
4	M	29.5	14.7	14.3	197.2	6.37	29.24	3.1	1.55	185.28	224.33	255.06	
5	T	31.6	7.8	12.3	203.7	6.23	29.39	3.1	1.63	187.78	250.03	243.70	Trace
6	W	26.5	6.9	7.1	190.8	6.22	30.04	3.1	1.69	203.85	246.67	229.02	
7	Th	31.1	8.7	5.7	191.8	6.18	29.23	3.1	1.70	216.62	227.25	222.54	
8	F	29.8	16.1	6.3	202.6	6.18	29.42	3.1	1.67	194.40	209.14	220.76	
9	Sa	24.9	8.8	5.3	204.7	6.26	29.29	3.2	1.69	203.46	193.70	213.00	0.68
10	Su	27.0	15.1	8.8	208.7	6.33	29.68	3.2	1.72	194.40	193.62	213.79	Trace
11	M	28.4	15.0	10.5	205.4	6.16	30.80	3.2	1.77	196.96	215.79	228.18	0.15
12	T	17.1	6.7	4.6	203.4	5.98	31.79	3.4	1.79	200.65	209.90	196.54	1.01
13	W	18.8	3.6	2.8	211.2	5.76	32.78	3.4	1.94	215.66	219.29	205.93	0.24
14	Th	19.3	5.0	3.6	214.5	5.61	33.10	3.4	1.84	202.11	234.48	192.91	0.26
15	F	19.5	5.5	2.9	158.4	5.63	33.77	3.7	1.72	200.30	222.49	178.63	0.28
16	Sa	20.0	7.3	3.4	189.7	5.85	33.73	3.7	1.72	225.09	192.23	173.16	Trace
17	Su	21.1	11.9	6.3	213.6	5.83	32.93	3.7	1.72	201.81	199.54	180.99	Trace
18	M	27.6	14.0	8.1	220.3	5.94	33.51	3.7	1.85	232.38	192.34	179.61	
19	T	28.0	9.0	4.3	228.0	5.81	33.34	3.7	1.89	199.52	196.32	195.32	
20	W	29.4	9.1	4.1	220.0	5.88	32.07	3.4	1.84	151.51	213.01	197.38	
21	Th	28.0	9.5	11.1	211.3	5.92	31.21	3.4	1.71	192.26	202.33	198.65	
22	F	29.7	7.4	3.4	206.5	6.23	30.15	3.2	1.59	204.48	195.99	213.75	0.08
23	Sa	25.1	4.5	2.1	220.2	6.29	29.73	3.2	1.56	210.61	187.08	203.09	0.15
24	Su	23.8	10.2	6.7	216.7	6.30	29.92	3.1	1.60	215.17	202.57	208.95	0.11
25	M	26.7	13.2	9.5	195.1	6.08	30.23	3.1	1.57	228.97	190.72	239.56	Trace
26	T	29.0	7.8	4.1	201.1	6.27	31.19	3.1	1.57	196.86	214.07	223.16	
27	W	30.4	7.8	3.5	213.1	6.19	30.78	3.1	1.64	204.59	205.54	219.59	0.02
28	Th	30.2	14.3	6.2	199.3	6.26	30.52	3.2	1.62	207.77	226.27	222.06	
29	F	21.7	11.6	2.4	192.5	6.32	30.11	3.2	1.62	213.51	227.41	226.05	0.04
30	Sa	28.3	13.9	3.4	183.9	6.42	29.49	3.1	1.52	211.90	210.21	243.52	0.07
31	Su	23.8	18.3	6.9	186.6	6.53	29.47	3.1	1.51	203.20	193.09	245.89	0.20

PLANT OPERATIONAL DATA

JUNE 1970

Date	Day	Kjeldahl Nitrogen mg/1 as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids			
										1968	1969	1970	
1	M	18.2	11.8	4.9	192.0	6.25	30.09	3.1	1.50	195.54	217.34	250.56	1.05
2	T	15.7	5.0	3.6	195.3	6.04	31.73	3.1	1.72	203.44		241.44	1.12
3	W	21.7	5.6	4.2	195.0	5.79	32.99	3.2	1.89	220.98		197.76	
4	Th	23.9	5.2	2.2	177.0	5.82	33.56	3.4	2.04	224.95	214.92	212.78	
5	F	24.5	5.3	3.1	153.0	6.01	32.36	3.4	2.02	218.64	211.55	236.76	
6	Sa	23.7	5.7	2.9	172.0	6.12	32.93	3.5	1.92	245.99	207.40	220.64	
7	Su	23.2	9.7	6.0	185.0	6.17	30.68	3.4	1.82	241.68	212.42	205.11	
8	M	23.9	11.1	7.8	190.0	6.27	31.20	3.6	1.72	233.17	198.91	205.09	
9	T	23.7	3.6	2.3	202.5	6.16	30.78	3.6	1.74	234.45	205.88	199.24	
10	W	26.5	4.1	3.4	206.5	6.19	30.37	3.6	1.69	208.04	239.61	216.94	
11	Th	25.5	7.0	10.8	212.5	6.29	29.14	3.4	1.66	234.37	256.73	228.34	
12	F	24.5	8.5	7.9	246.0	6.30	28.78	3.2	1.53	240.29	249.40	220.89	.20
13	Sa	24.4	4.9	7.3	230.9	6.39	28.67	3.2	1.47	245.62	248.27	225.40	.35
14	Su	21.3	11.9	8.4	220.6	6.30	28.85	3.2	1.50	224.50	252.55	212.76	.24
15	M	26.9	13.0	9.5	231.0	6.33	30.21	3.2	1.53	218.66	260.01	231.34	
16	T	26.5	8.4	4.8	223.5	6.13	30.03	3.3	1.62	204.93	275.63	240.79	
17	W	23.7	6.2	5.9	207.0	6.22	29.63	3.2	1.61	220.63	282.67	218.47	
18	Th	25.8	6.0	8.7	206.5	6.30	28.97	3.2	1.58	228.25	253.20	218.71	.08
19	F	26.2	7.8	3.1	207.0	6.42	29.79	3.2	1.55	226.70	246.94	200.91	
20	Sa	27.3	7.1	3.6	195.0	6.24	29.81	3.1	1.56	206.56	263.80	222.83	.22
21	Su	25.9	13.4	10.9	192.0	6.16	30.29	3.1	1.55	217.95	261.27	231.25	.01
22	M	24.9	16.1	9.5	189.5	6.21	30.30	3.1	1.53	196.59	275.38	237.06	
23	T	25.3	5.6	3.8	194.0	6.11	30.47	3.1	1.64	187.97	249.12	222.12	
24	W	24.6	4.6	7.1	180.0	6.24	29.38	3.1	1.69	212.23	250.70	242.56	.01
25	Th	26.5	5.6	7.3	180.5	6.32	29.11	3.1	1.67	229.10	248.62	245.78	
26	F	24.8	6.2	14.3	193.5	6.44	28.71	3.0	1.59	228.20	235.99	238.99	.64
27	Sa	27.2	6.7	6.0	190.5	6.41	28.54	3.0	1.52	206.24	204.09	239.81	
28	Su	26.9	15.7	9.5	189.5	6.46	28.65	3.0	1.57	207.45	213.25	235.48	Trace
29	M	23.1	15.4	9.5	176.5	6.27	29.32	3.0	1.67	221.50	229.66	241.11	
30	T	21.3	6.8	37.0	178.0	6.11	30.26	3.0	1.91	218.57	262.07	262.44	
31													

PLANT OPERATIONAL DATA JULY 1970

Date	Day	Kjeldahl Nitrogen mg/l as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids			
										1968	1969	1970	
1	W	26.5	7.6	5.5	187.5	6.12	29.90	3.0	1.89	217.32	229.63	244.17	Trace
2	Th	24.9	6.7	4.5	203.5	6.14	29.38	3.0	1.86	254.69	254.67	231.84	
3	F	29.7	6.6	5.2	188.5	6.46	29.25	2.9	1.80	229.02	200.77	253.70	
4	Sa	23.4	10.1	5.0	173.5	6.38	29.00	2.9	1.67	229.31	224.62	255.23	.06
5	Su	23.1	15.3	5.3	92.7	6.44	29.83	2.7	1.67	219.56	277.84	293.07	
6	M	26.9	16.0	5.7						221.03	216.33		
7	T	23.2	13.9	5.2						235.91	276.85		
8	W	26.0	7.8	10.9	69.7	6.28	29.31	2.8	1.93	237.78	267.18		.51
9	Th	27.6	9.4	10.1	164.5	6.01	30.86	2.8	1.82	253.38	275.16	360.20	Trace
10	F	24.9	13.0	5.7	188.0	5.87	31.10	3.0	1.98	263.85	248.96	246.88	
11	Sa	25.1	10.8	3.5	176.0	5.99	31.65	2.9	2.10	245.34	241.33	335.41	
12	Su	24.2	14.3	6.3	190.9	6.09	31.54	2.9	1.79	240.72	263.90	282.71	
13	M	23.7	11.1	4.8	185.3	5.89	31.71	2.9	1.77	221.15	236.49	256.81	.03
14	T	19.7	3.9	2.7	176.5	5.98	31.48	2.9	2.00	250.06	262.02	242.20	.15
15	W	22.7	4.3	2.1	183.0	5.82	32.63	2.9	2.36	240.88	285.38	297.58	.02
16	Th	24.8	5.2	3.1	202.6	5.63	33.26	3.0	2.27	268.33	227.47	284.40	
17	F	24.1	9.0	2.5	224.7	5.79	32.57	3.1	1.98	260.73	189.53	228.65	.06
18	Sa	22.3	6.4	2.1	227.6	6.07	31.61	3.1	1.81	241.70	184.91	227.29	.01
19	Su	21.7	8.0	2.9	219.8	6.15	31.82	3.1	1.80	253.25	199.16	230.59	.36
20	M	26.3	8.0	3.2	227.4	6.04	31.66	3.1	1.79	212.44	195.60	210.66	
21	T	26.5	4.9	3.1	216.1	6.01	31.08	3.1	1.88	222.28	195.67	209.66	
22	W	26.7	4.3	2.7	116.9	6.17	30.50	3.1	1.86	212.04	194.56	291.50	
23	Th	28.4	5.9	3.8	124.8	6.17	30.21	3.0	1.79	226.16	218.18	335.39	Trace
24	F	26.7	6.0	4.5	235.3	6.19	28.88	3.0	1.53	232.67	229.49	263.05	
25	Sa	22.3	4.9	2.8	202.4	6.48	29.21	3.0	1.48	212.41	243.54	277.60	
26	Su	23.5	5.7	2.4	207.5	6.19	29.34	3.0	1.46	206.30	244.17	260.93	.05
27	M	24.9	4.9	2.9	213.3	6.09	30.23	3.1	1.58	221.45	255.37	230.92	.40
28	T	25.9	3.6	2.5	217.9	6.02	29.89	3.2	1.66	216.25	235.42	235.20	.19
29	W	26.5	5.0	2.1	204.7	5.95	29.66	3.1	1.69	227.92	215.63	226.05	Trace
30	Th	24.8	5.3	2.9	211.4	6.05	29.13	3.0	1.59	234.25	217.09	237.68	.05
31	F	24.4	7.1	6.4	196.4	6.16	28.39	3.0	1.53	247.00	208.15	232.93	.04

PLANT OPERATIONAL DATA AUGUST 1970

Date	Day	Kjeldahl Nitrogen mg/1 as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
								pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids			
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %			1968	1969	1970	
1	Sa	21.3	7.6	6.2	182.3	6.21	29.13	3.0	1.49	217.26	211.42	255.17	
2	Su	21.8	10.9	7.4	184.0	6.10	30.57	3.0	1.42	216.32	218.88	237.59	Trace
3	M	25.6	9.8	6.3	188.5	6.09	30.70	3.0	1.46	211.93	235.75	246.43	
4	T	27.2	7.1	4.2	195.9	5.95	31.17	3.0	1.54	212.02	231.35	242.21	
5	W	28.8	7.7	5.0	192.4	5.90	30.33	3.0	1.57	216.59	247.46	249.71	
6	Th	25.2	7.8	5.7	190.1	6.05	29.51	3.0	1.58	238.46	276.61	262.13	
7	F	27.7	6.7	5.2	230.6	6.19	28.80	3.0	1.62	231.57	247.46	203.95	
8	Sa	26.6	9.2	7.0	219.0	6.22	29.16	2.9	1.66	229.33	228.81	227.05	
9	Su	25.8	14.8	10.1	218.5	6.24	29.24	2.9	1.62	224.75	253.81	243.25	Trace
10	M	25.6	14.1	7.7	212.4	6.17	29.84	2.9	1.73	209.96	247.44	267.27	
11	T	25.9	7.0	5.2	219.5	5.91	30.20	3.1	1.94	235.99	235.99	250.31	
12	W	26.0	7.4	3.4	221.1	5.94	30.77	3.3	1.96	236.96	243.61	228.97	
13	Th	26.9	7.1	4.2	215.7	6.02	29.42	3.4	1.90	242.85	218.47	223.92	
14	F	26.3	9.4	4.1	226.4	6.14	29.32	3.2	1.79	228.37	208.04	215.51	
15	Sa	23.7	10.4	3.6	226.0	6.17	28.64	3.1	1.68	221.36	222.59	219.96	
16	Su	23.7	14.4	4.6	223.7	6.35	28.87	3.1	1.67	215.80	201.09	221.54	
17	M	21.3	10.4	2.5	191.3	6.03	31.12	3.3	1.92	196.95	192.80	239.31	
18	T	24.5	6.2	2.2	225.8	5.80	30.32	3.3	2.02	196.16	211.60	208.28	
19	W	25.1	6.0	2.4	211.6	5.87	29.28	3.1	1.95	217.67	211.15	242.51	0.27
20	Th	27.7	6.2	2.8	223.7	5.96	29.29	3.1	1.76	208.88	207.06	222.06	0.01
21	F	25.2	9.0	3.9	215.2	6.15	29.10	3.1	1.65	209.29	222.79	216.12	
22	Sa	26.9	10.4	5.6	211.1	6.20	28.62	3.1	1.50	227.93	208.93	217.73	
23	Su	25.8	16.4	6.2	200.4	6.42	28.74	3.1	1.47	220.00	238.88	213.21	
24	M	29.1	16.1	3.9	187.9	6.31	29.16	3.1	1.64	224.90	198.63	214.56	.04
25	T	27.3	9.9	2.9	174.3	6.06	29.47	3.1	1.90	241.27	220.98	243.16	
26	W	27.2	7.3	2.7	188.0	6.02	29.27	3.1	1.81	216.18	206.33	231.14	Trace
27	Th	28.7	8.7	4.2	192.5	6.21	28.31	3.1	1.47	247.68	190.13	220.41	
28	F	28.6	8.7	4.8	202.5	6.44	27.25	3.0	1.34	231.95	188.79	214.22	
29	Sa	23.0	9.1	6.0	198.5	6.60	27.28	3.0	1.30	220.96	201.23	209.57	0.32
30	Su	25.6	15.1	9.5	194.0	6.33	29.53	3.0	1.32	225.71	185.48	218.09	
31	M	28.8	16.1	6.0	193.8	6.17	30.49	3.0	1.47	252.40	191.23	260.37	

PLANT OPERATIONAL DATA SEPTEMBER 1970

Date	Day	Kjeldahl Nitrogen mg/l as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids			
										1968	1969	1970	
1	T	28.7	8.4	3.6	185.1.	5.99	29.68	3.0	1.61	215.44	207.64	257.61	
2	W	26.3	7.4	4.2	196.6	6.11	29.65	3.0	[illegible]	221.40	362.32	253.43	.56
3	Th	21.7	5.9	4.2	186.5	6.26	28.61	3.0	[illegible]	237.18	230.85	238.13	.54
4	F	27.4	9.1	5.9	186.5	6.23	29.08	3.0	1.41	244.69	205.57	254.59	
5	Sa	25.6	11.5	6.3	187.5	6.29	29.06	3.0	1.42	241.08	218.29	255.92	
6	Su	15.8	12.3		187.5	6.18	28.91	3.0	1.44	233.09	208.73	265.16	1.44
7	M	20.4	12.0	2.8	163.0	6.03	30.54	3.0	1.56	225.07	213.76	269.09	Trace
8	T	26.3	10.5	3.2	117.6	5.70	33.25	3.3	1.68	227.72	238.56	327.39	
9	W	23.9	6.2	3.1	170.0	5.58	33.26	3.3	1.83	224.36	253.05	246.92	.53
10	Th	26.6	3.5	3.9	174.5	5.80	31.13	3.3	1.76	237.17	229.97	237.19	Trace
11	F	28.7	7.1	6.2	187.4	6.07	29.25	3.1	1.62	239.08	243.73	209.54	
12	Sa	25.8	8.1	8.0	183.1	6.26	28.45	3.0	1.47	214.90	236.23	234.43	.16
13	Su	21.1	11.6	8.3	187.0	6.32	29.11	3.0	1.46	214.23	268.79	222.66	.18
14	M	23.0	9.9	8.0	179.6	6.30	29.32	3.0	1.50	219.84	235.78	240.32	.22
15	T	18.3	4.8	3.6	180.6	6.14	29.52	3.0	1.53	251.02	292.70	230.75	.86
16	W	25.6	4.9	4.3	180.8	5.97	30.32	3.1	1.62	226.75	243.91	244.23	
17	Th	21.1	6.9	2.8	200.6	6.07	30.14	3.2	1.61	230.62	236.94	231.02	.66
18	F	25.5	6.2	3.4	210.8	6.36	29.41	3.2	1.56	228.18	266.11	214.37	
19	Sa	23.9	7.6	4.2	195.4	6.42	28.86	3.2	1.49	247.54	272.99	232.71	
20	Su		10.8	4.1	197.8	6.38	28.29	3.1	1.50	220.67	279.67	243.88	
21	M	24.8	9.7	2.9	193.0	6.32	29.33	3.1	1.54	233.48	273.08	252.96	.06
22	T	26.6	4.6	3.1	193.8	6.12	29.08	3.1	1.57	240.88	269.30	264.47	.11
23	W	23.7	6.0	3.8	191.3	6.23	28.71	3.1	1.48	224.76	263.79	250.20	1.19
24	Th	20.6	5.3	3.8	209.7	6.42	28.42	3.1	1.44	226.24	231.96	225.79	.27
25	F	23.7	6.3	4.3	194.0	6.28	29.40	3.1	1.49	175.66	276.38	227.56	.13
26	Sa	23.0	7.4	4.6	174.3	6.29	30.00	3.1	1.39	199.12	269.91	243.17	.02
27	Su	22.8	11.8	4.1	186.9	6.15	29.97	3.1	1.48	219.83	286.09	251.37	Trace
28	M	30.5	12.3	4.9	190.7	6.15	30.57	3.1	1.59	224.51	296.21	241.42	
29	T	28.7	9.0	3.8	194.8	6.12	30.16	3.1	1.59	217.38	271.83	241.64	
30	W	30.2	6.3	4.2	203.5	6.14	29.65	3.1	1.64	236.73	254.74	260.64	
31													

PLANT OPERATIONAL DATA OCTOBER 1970

Date	Day	Kjeldahl Nitrogen mg/l as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids			
										1968	1969	1970	
1	Th	31.5	7.8	4.8	201.0	6.36	27.93	3.1	1.52	230.53	266.25	232.32	
2	F	31.4	11.3	6.7	201.5	6.39	27.63	3.1	1.49	237.92	301.36	234.04	
3	Sa	27.7	10.2	7.6	203.2	6.37	28.06	3.1	1.43	231.47	298.87	229.49	
4	Su	27.0	14.3	9.2	204.2	6.45	28.30	3.1	1.48	235.04	320.60	235.50	
5	M	30.4	14.3	8.8	181.4	6.21	28.59	3.1	1.57	227.42	304.67	263.45	
6	T	30.5	8.0	5.7	212.1	6.11	29.49	3.3	1.76	245.96	270.96	237.63	
7	W	30.4	9.2	6.9	214.1	6.14	28.59	3.3	1.91	278.60	292.44	211.29	.03
8	Th	30.7	18.2	9.5	200.2	6.13	27.71	3.3	1.84	262.31	301.08	234.64	.06
9	F	28.7	10.6	11.6	200.0	6.32	27.92	3.1	1.79	249.16	310.57	239.96	.04
10	Sa	27.6	11.5	10.1	211.4	6.48	27.27	2.9	1.64	230.67	331.65	252.72	Trace
11	Su	30.0	16.4	12.6	190.8	6.48	27.41	2.9	1.50	236.87	325.33	249.64	
12	M	32.8	17.8	13.0	180.0	6.28	28.53	2.9	1.64	219.71	311.96	268.11	
13	T	32.5	11.2	9.2	188.7	6.06	28.69	2.9	1.73	222.20	284.14	269.10	.06
14	W	33.2	10.6	8.5	176.0	6.13	28.51	3.0	1.77	224.57	267.36	288.15	.01
15	Th	34.6	13.3	13.9	193.2	6.17	27.29	3.0	1.63	239.15	225.29	256.69	
16	F	34.9	13.7	16.5	190.8	6.40	26.96	3.0	1.60	243.87	246.13	253.25	
17	Sa	30.1	13.9	11.9	196.5	6.44	26.89	2.9	1.49	243.43	238.29	293.48	
18	Su	29.3	15.1	14.1	184.1	6.48	26.42	2.9	1.49	253.99	217.82	295.81	
19	M	33.2	18.8	13.7	196.2	6.48	27.35	2.9	1.50	260.30	229.48	284.36	
20	T	31.5	12.0	8.7	166.1	6.23	27.28	3.0	1.71	242.97	208.04	297.25	.09
21	W	33.6	11.6	7.8	179.3	6.18	27.82	3.0	1.77	249.19	200.94	287.96	
22	Th	32.5	12.5	13.2	198.1	6.22	27.10	3.0	1.74	257.15	204.29	250.55	.04
23	F	30.9	13.0	17.2	179.5	6.29	26.78	2.9	1.71	231.31	210.51	278.35	.25
24	Sa	30.7	12.7	11.1	200.0	6.40	26.40	2.9	1.62	223.78	222.80	317.52	.01
25	Su	29.4	20.4	16.8	199.0	6.46	26.83	2.9	1.68	224.91	234.62	295.22	
26	M	34.6	18.9	14.6	206.3	6.33	27.36	3.0	1.64	242.86	226.87	260.45	
27	T	27.9	9.4	7.0	200.8	6.12	27.85	3.0	1.73	234.01	213.66	251.94	.54
28	W	23.2	4.5	3.6	188.5	6.06	28.26	3.0	1.83	240.43	223.52	256.47	.53
29	Th	32.6	7.8	8.3	206.0	6.08	28.77	3.0	1.85	220.60	235.33	241.25	
30	F	31.6	9.9	8.7	215.0	6.08	28.59	2.9	1.87	247.66	236.16	281.20	.16
31	Sa	27.2	8.5	8.3	227.0	6.24	28.04	2.9	1.72	243.68	211.53	295.54	.27

PLANT OPERATIONAL DATA NOVEMBER 1970

Date	Day	Kjeldahl Nitrogen mg/1 as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	Waste Sludge % Solids	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids 1968	1969	1970	
1	Su	24.5	15.8	8.8	237.5	6.34	27.77	2.9	1.56	246.15	184.46	267.86	
2	M	24.5	15.5	11.5	203.2	6.27	29.01	3.0	1.75	257.81	197.62	255.41	0.45
3	T	23.5	9.2	3.6	203.8	6.00	29.01	3.2	1.81	254.80	196.10	211.09	0.19
4	W	27.6	8.5	3.6	180.0	6.13	29.28	3.2	1.93	266.56	198.09	209.27	0.12
5	Th	29.1	8.0	3.6	207.3	6.10	27.76	3.1	1.82	277.07	191.41	204.88	
6	F	23.0	6.9	3.6	218.6	6.22	27.21	3.1	1.70	235.29	221.50	229.79	
7	Sa	21.3	9.2	7.1	229.8	6.38	26.76	3.1	1.58	195.81	189.77	225.44	
8	Su	27.3	17.9	8.3	217.2	6.44	27.04	3.1	1.54	195.37	202.42	237.47	
9	M	26.6	13.7	5.6	211.7	6.34	27.75	3.1	1.57	226.39	214.35	266.55	0.27
10	T	20.8	5.3	2.3	227.7	6.28	28.57	3.1	1.69	237.23	230.67	260.99	0.15
11	W	30.1	7.8	3.2	235.4	6.59	27.90	3.1	1.77	229.13	233.16	241.56	
12	Th	30.7	8.7	3.6	218.0	6.13	27.85	3.1	1.80	238.69	231.98	264.42	
13	F	29.8	9.9	5.7	222.5	6.23	27.56	3.0	1.65	253.31	244.51	269.85	Trace
14	Sa	23.0	11.1	4.6	213.3	6.43	27.04	3.0	1.51	230.85	255.59	305.94	0.03
15	Su	28.7	17.4	5.7	208.3	6.41	26.95	3.0	1.54	238.45	250.68	258.94	Trace
16	M	31.9	16.9	6.4	206.5	6.41	27.49	3.0	1.55	243.17	259.45	260.41	
17	T	30.9	11.3	5.7	200.3	6.36	27.51	3.0	1.62	241.79	265.35	286.48	
18	W	32.9	10.5	7.3	218.4	6.27	26.47	3.0	1.71	270.01	254.49	249.17	Trace
19	Th	31.5	13.4	9.1	221.8	6.35	26.84	3.0	1.68	290.53	240.16	261.72	0.01
20	F	26.2	6.9	11.5	204.7	6.39	26.92	3.0	1.59	260.86	241.56	309.24	0.62
21	Sa	31.5	13.4	9.1	236.7	6.24	27.25	3.0	1.5[illegible]	262.73	251.39	235.11	
22	Su	29.3	14.7	9.2	195.5	6.34	27.67	3.0	1.60	267.92	267.39	278.01	
23	M	30.7	15.1	9.9	198.3	6.34	28.44	3.0	1.68	271.50	281.23	285.80	Trace
24	T	32.8	9.2	7.7	191.8	6.31	28.58	3.0	1.69	282.05	280.08	283.41	0.01
25	W	32.8	10.6	7.0	185.4	6.26	27.76	3.0	1.71	258.80		266.98	Trace
26	Th	30.9	7.8	7.0	201.2	6.44	26.89	3.0	1.74	258.95	238.33	273.78	0.03
27	F	34.9	16.7	11.8	197.2	6.57	27.19	3.0	1.63	268.76	277.57	298.50	0.12
28	Sa	31.2	16.7	11.3	210.0	6.61	27.16	3.1	1.56	265.88	254.02	260.89	0.01
29	Su	28.0	18.1	9.1	221.0	6.55	26.97	3.2	1.61	265.96	242.48	234.20	0.02
30	M	32.5	18.1	9.8	204.1	6.33	27.21	3.2	1.76	241.14	274.62	235.70	Trace
31													

PLANT OPERATIONAL DATA DECEMBER 1970

Date	Day	Kjeldahl Nitrogen mg/l as N			Milorganite As Received Basis			Average Ferric Chloride Use					Precipitation Water Equivalent Inches
									Waste Sludge	lbs. Anhydrous $FeCl_3$ per Dry tons recovered Solids			
		SS	WPE	EPE	Tons/ Day	Nitrogen % N	Ash %	pH	% Solids	1968	1969	1970	
1	T	31.8	11.6	8.1	207.1	6.23	27.35	3.2	1.83	242.00	289.16	226.77	.01
2	W	33.6	8.1	6.7	221.3	6.26	27.20	3.2	1.77	250.24	273.27	236.18	
3	Th	30.8	8.3	7.1	211.3	6.55	26.33	3.2	1.65	256.08	272.21	244.70	.27
4	F	33.0	10.2	6.4	225.7	6.48	26.09	3.0	1.52	228.22	248.08	252.84	Trace
5	Sa	32.9	8.7	7.6	219.4	6.56	25.91	3.1	1.42	244.99	236.14	245.98	
6	Su	27.9	13.4	10.8	221.8	6.57	25.97	3.1	1.37	241.67	221.45	250.50	
7	M	35.3	16.4	11.9	201.4	6.60	26.21	3.2	1.39	241.29	233.38	232.36	
8	T	35.0	11.3	9.9	191.0	6.46	26.29	3.2	1.49	233.92	222.37	247.59	
9	W	34.6	9.8	8.7	200.1	6.50	25.96	3.2	1.45	207.49	207.89	244.16	
10	Th	38.1	11.6	14.8	200.8	6.57	25.61	3.2	1.40	204.49	228.03	255.71	1.08
11	F	26.2	13.7	16.0	207.9	6.59	25.41	3.2	1.42	222.84	235.82	244.12	.71
12	Sa	27.6	11.9	11.9	207.8	6.63	25.61	3.2	1.40	219.66	195.40	219.66	.13
13	Su	25.3	15.7	16.1	203.6	6.59	25.55	3.2	1.39	237.26	207.03	220.27	.07
14	M	29.7	15.8	15.5	219.0	6.52	26.02	3.2	1.42	207.82	214.54	211.13	
15	T	29.0	10.6	12.3	208.1	6.45	26.03	3.2	1.55	221.93	208.39	233.53	
16	W	23.7	6.6	5.3	210.5	6.34	25.50	3.2	1.58	243.97	187.01	229.70	.24
17	Th	27.7	7.6	5.5	215.0	6.35	25.35	3.2	1.57	266.06	186.68	207.30	Trace
18	F	27.4	7.0	7.8	211.5	6.38	25.53	3.1	1.53	242.11	193.19	232.23	Trace
19	Sa	25.1	6.4	6.9	216.0	6.60	25.48	3.1	1.43	236.81	203.91	216.76	Trace
20	Su	24.2	11.3	9.7	222.4	6.73	25.41	3.1	1.39	210.02	190.52	235.58	
21	M	28.7	14.1	11.3	211.7	6.65	25.98	3.1	1.44	207.56	201.16	262.77	.09
22	T	29.5	9.5	8.5	211.2	6.45	25.79	3.2	1.46	215.26	196.77	237.86	.15
23	W	29.4	8.5	8.7	178.6	6.44	26.79	3.2	1.47	176.22	220.92	244.30	
24	Th	28.3	11.5	7.0	210.2	6.43	25.71	3.1	1.42	201.92	243.67	225.90	.01
25	F	25.9	13.6	11.2	206.0	6.63	25.88	3.0	1.38	208.92	263.60	260.31	.03
26	Sa	28.7	17.5	15.0	182.5	6.66	25.93	3.0	1.36	230.33	263.99	304.22	.19
27	Su	26.6	14.0	14.6	185.8	6.65	26.58	3.1	1.42	222.70	248.19	270.89	
28	M	31.1	17.5	14.0	168.1	6.49	26.60	3.1	1.56	197.04	267.57	229.23	
29	T	31.9	11.3	8.8	169.1	6.37	26.81	3.1	1.72	201.99	225.12	241.08	.04
30	W	33.9	9.1	5.7	200.1	6.27	26.48	3.1	1.75	214.54	266.71	205.37	
31	Th	34.2	9.5	6.6	195.7	6.39	25.78	3.1	1.68	203.40	257.01	209.85	Trace

APPENDIX I

X-ray Diffraction Techniques

To use x-ray diffraction techniques to explore crystalline species in the sludge, the material must be changed from a liquid to a powder. Air drying at room temperature and freeze drying were chosen for drying because the temperature at which sludge was initially formed would not be drastically exceeded.

Liquid sludge was obtained from the sewage plant. This was centrifuged and the bulk of the liquid removed. The concentrated sludge was placed in a Virtis Automatic Freeze Dryer, Model 10-010, and dried. The freeze dried material thus obtained was fibrous in character. When ground it appeared as a fine fluffy powder. Air dried material appeared in the form of hard, millimeter sized particles and when ground yielded a granular powder which was easier to handle.

A crystalline sample selected from mineral Vivianite was obtained from a commercial source. This material was found to be magnetic. It was reasoned that if one of the chemical species of interest in the sludge was an iron phosphate compound, it could be separated and concentrated by a magnetic separation technique and identified.

The sludge sample, whether freeze dried or air dried, was separated by dropping it through a high itensity magnetic field. The powdered sludge residue was dropped through a 2 inch diameter glass cylinder placed between a 10 kilo-gauss electro-magnet. The magnetically separated material adhered to the side of the cylinder and the nonmagnetic material dropped through.

The magnetically separated material was then loaded into a 0.5 mm diameter glass capillary. These capillaries were mounted in a 114.6 mm Philips powder diffraction camera. The specimens were then exposed to a beam of x-ray radiation, obtained from an iron x-ray tube, for periods of time ranging from 2 to 6 hours. The x-ray diffraction patterns were recorded on film in the form of lines of varying intensities at various angular positions.

The angular positions of the x-ray diffraction lines were used to calculate the interplanar d-spacings of the unknown crystalline materials. These d-spacings were compared with standard patterns of crystalline materials in the ASTM files. This allowed the identification of the crystalline species in the sludge residue.

APPENDIX J

% FREE ACID IN PICKLE LIQUOR

From the A. O. Smith Corporation

DATE	SPECIFIC GRAVITY	% FREE H_2SO_4 ACID
2-17-70	1.184	4.5
2-18-70	1.185	2.7
2-19-70	1.262	5.0
2-20-70	1.264	5.8
2-23-70	1.242	4.9
2-24-70	1.268	3.9
2-25-70	1.246	4.1
2-26-70	1.270	4.6
2-27-70	1.285	4.3
3- 2-70	1.251	4.1
3- 3-70	1.202	4.5
3- 4-70	1.192	4.3
3- 5-70	1.273	5.2
3- 6-70	1.261	2.7
3- 9-70	1.294	4.0
3-10-70	1.229	4.6
3-11-70	1.288	4.5
3-12-70	1.291	4.2
3-13-70	1.238	3.9
3-16-70	1.277	3.9
3-17-70	1.217	5.6
3-18-70	1.181	3.3
3-19-70	1.288	2.1
3-20-70	1.300	5.7
3-23-70	1.304	4.2
3-24-70	1.266	3.9
3-25-70	1.307	4.7
3-26-70	1.320	4.3
8- 4-70	1.263	4.2
8- 4-70	1.284	4.3
8- 5-70	1.273	4.0
8- 6-70	1.283	4.5
8- 6-70	1.280	4.6
8- 7-70	1.268	4.8
8- 7-70	1.321	5.2
8-10-70	1.319	5.0
8-10-70	1.331	5.0
8-11-70	1.316	4.8
8-12-70	1.301	4.3
8-13-70	1.216	4.7
8-13-70	1.223	5.0
8-14-70	1.221	5.0
8-14-70	1.272	5.3
8-17-70	1.252	4.9
8-17-70	1.267	5.0
8-17-70	1.264	4.8
8-18-70	1.260	4.5
8-19-70	1.281	4.4
Ave	1.264	4.5
Max	1.331	5.8
Min	1.181	2.1

From U. S. Steel Corporation

DATE	SPECIFIC GRAVITY	% FREE H_2SO_4 ACID
11- 4-70	1.180	8.1
11- 4-70	1.186	8.0
11- 4-70	1.172	8.2
11- 5-70	1.206	7.7
11- 5-70	1.202	7.6
11- 5-70	1.194	
11- 6-70	1.198	7.8
11- 6-70	1.206	7.3
11- 6-70	1.202	7.4
11- 9-70	1.198	7.7
11- 9-70	1.195	8.9
11- 9-70	1.194	7.5
11-10-70	1.198	7.2
11-10-70	1.194	6.8
11-10-70	1.196	6.6
11-11-70	1.203	6.9
11-11-70	1.203	7.2
11-12-70	1.201	6.9
11-12-70	1.201	7.5
11-12-70	1.201	7.5
11-13-70	1.201	8.8
11-13-70	1.203	7.8
11-13-70	1.202	7.9
11-16-70	1.210	7.9
11-16-70	1.223	7.6
11-16-70	1.209	7.8
11-17-70	1.194	8.0
11-17-70	1.194	8.9
11-17-70	1.196	8.9
11-18-70	1.196	8.3
11-18-70	1.200	8.5
11-18-70	1.200	8.5
11-19-70	1.192	8.2
11-19-70	1.200	8.9
11-20-70	1.208	6.8
11-23-70	1.193	7.6
11-24-70	1.220	7.6
11-24-70	1.222	7.2
11-27-70	1.206	7.2
11-27-70	1.198	7.6
11-27-70	1.204	7.6
11-27-70	1.188	7.8
11-30-70	1.185	7.3
11-30-70	1.182	7.5
11-30-70	1.181	7.5
12- 1-70	1.184	8.3
12- 1-70	1.186	8.5
12- 1-70	1.186	9.3
Ave	1.198	7.8
Max	1.223	9.3
Min	1.172	6.6

APPENDIX K

ALKALINITY AS mg/l $CaCO_3$

DATE RUN 1970	SCREENED SEWAGE		WEST PLANT EFFLUENT		EAST PLANT EFFLUENT	
	Original pH	Alkalinity	Original pH	Alkalinity	Original pH	Alkalinity
6-23			7.8	206	7.5	172
6-24			7.8	210	7.4	170
6-25			7.7	200	7.4	168
7- 1			7.8	210	7.9	166
7- 5			7.9	200	7.9	124
7- 8			7.9	190	7.8	130
7-12			8.1	200	7.8	136
7-13			7.9	200	7.7	150
7-19			7.9	170	7.2	114
7-21			7.7	190	7.6	164
7-23			7.8	188	8.1	142
7-26			7.6	182	7.6	158
8- 3			8.0	196	7.9	134
8- 4			7.6	192	7.1	166
8- 5			7.8	206	7.6	184
8- 6			7.6	196	7.8	168
8- 7			7.9	208	7.8	166
8- 8			7.8	200	7.7	146
8- 9			8.0	202	7.7	144
8-10			8.1	174	7.8	124
8-12			7.3	190	7.2	152
8-13			7.6	194	7.4	130
10-14	7.0	232	6.9	232	6.9	196
10-19	6.9	220	6.9	234	7.4	188
10-20	6.8	204	7.2	220	7.1	182
10-21	6.9	230	7.1	232	7.0	186
10-22	7.0	218	7.0	224	7.3	192
10-26	6.9	214	7.2	228	7.0	184
10-27	6.9	184	7.7	232	6.9	172
10-30	6.9	228	7.0	198	7.3	166
11- 3	6.9	230	7.2	214	7.3	164
11- 4	6.9	232	7.5	216	7.3	148
11-11	6.9	238	7.4	232	7.2	190
11-12	7.0	234	7.5	246	7.6	188
11-17	6.6	176	7.2	224	7.1	180
11-18	6.7	210	7.2	230	7.2	190
11-19	7.0	218	7.5	230	7.4	190
12- 1	7.0	240	7.8	262	7.8	204
12- 2	7.0	248	7.5	244	7.6	194
12- 3	6.9	226	7.6	220	7.6	188
12- 7	7.0	240	7.5	242	7.4	192
12- 8	6.9	230	7.4	232	7.7	200
12-15	6.9	226	7.3	220	7.3	192
12-17	6.9	232	7.3	218	7.3	180
12-29	6.9	246	7.2	244	7.3	214
Ave	6.9	224	7.5	213	7.5	169

APPENDIX K(CONT.)

MIXED LIQUOR ALKALINITY

Date 1970	WEST PLANT		EAST PLANT	
	Original pH	Alkalinity	Original pH	Alkalinity
6-23	7.2	204	6.9	180
6-24	7.3	196	7.3	180
6-25	7.2	200	7.0	176
7-1	7.7	190	7.4	192
7-5	7.6	206	7.4	216
7-8	7.0	202	7.1	204
7-12	7.9	180	7.9	194
7-13	7.6	190	7.8	192
7-19	7.4	182	7.0	164
7-21	7.2	196	7.0	192
7-23	7.3	194	7.0	200
8-6	7.4	196	7.2	184
8-9	7.3	194	7.2	182
8-10	7.5	224	7.4	190
8-12	7.1	198	6.9	166
AVE.	7.4	197	7.2	187

APPENDIX L

SOLUBLE SULFATE CONCENTRATION - REPORTED AS mg/1 SO_4

DATE 1970	SCREENED SEWAGE	EFFLUENTS WEST	EFFLUENTS EAST
2-22	75	90	92
2-24	114	152	109
2-25	119	148	110
3- 1 thru 3-7	116	139	115
8- 1	80	130	100
8- 2	125	115	90
8- 3	83	103	91
8- 4	95	110	88
8- 5	90	118	103
8- 6	91	120	103
8- 7	100	128	80
8- 8	88	105	88
8- 9	60	105	91
8-10	95	110	70
8-12	87	118	100
8-13	95	130	79
8-14	75	125	152
8-15	65	118	122
8-16	40	103	103
8-17	83	90	103
8-18	98	110	130
8-20	83	118	131
8-21	88	118	131
8-22	83	115	123
8-23	59	98	115
8-24	91	108	122

DATE 1970	SCREENED SEWAGE	EFFLUENTS WEST	EFFLUENTS EAST
8-23 thru 8-29	-	120	140
8-30 thru 9- 5	118	131	133
9- 6 thru 9-13	112	108	135
9-14 thru 9-19	103	98	131
9-20 thru 9-26	110	118	145
9-27 thru 10- 3	115	125	151
10- 4 thru 10-10	151	130	148
10-11 thru 10-17	122	130	148
10-18 thru 10-24	138	138	148
10-25 thru 10-31	110	125	140
11- 1 thru 11- 7	118	108	151
11- 8 thru 11-14	122	138	163
11-15 thru 11-21	145	118	158
11-22 thru 11-28	118	125	130
11-29 thru 12- 5	-	-	-
12- 6 thru 12-12	124	133	154
12-13 thru 12-19	118	124	151
12-20 thru 12-26	108	119	144
12-27 thru 1- 2	110	118	138
Average (8/23-1/2)	120	123	145

All Daily Samples Represent 24 hr. Composites

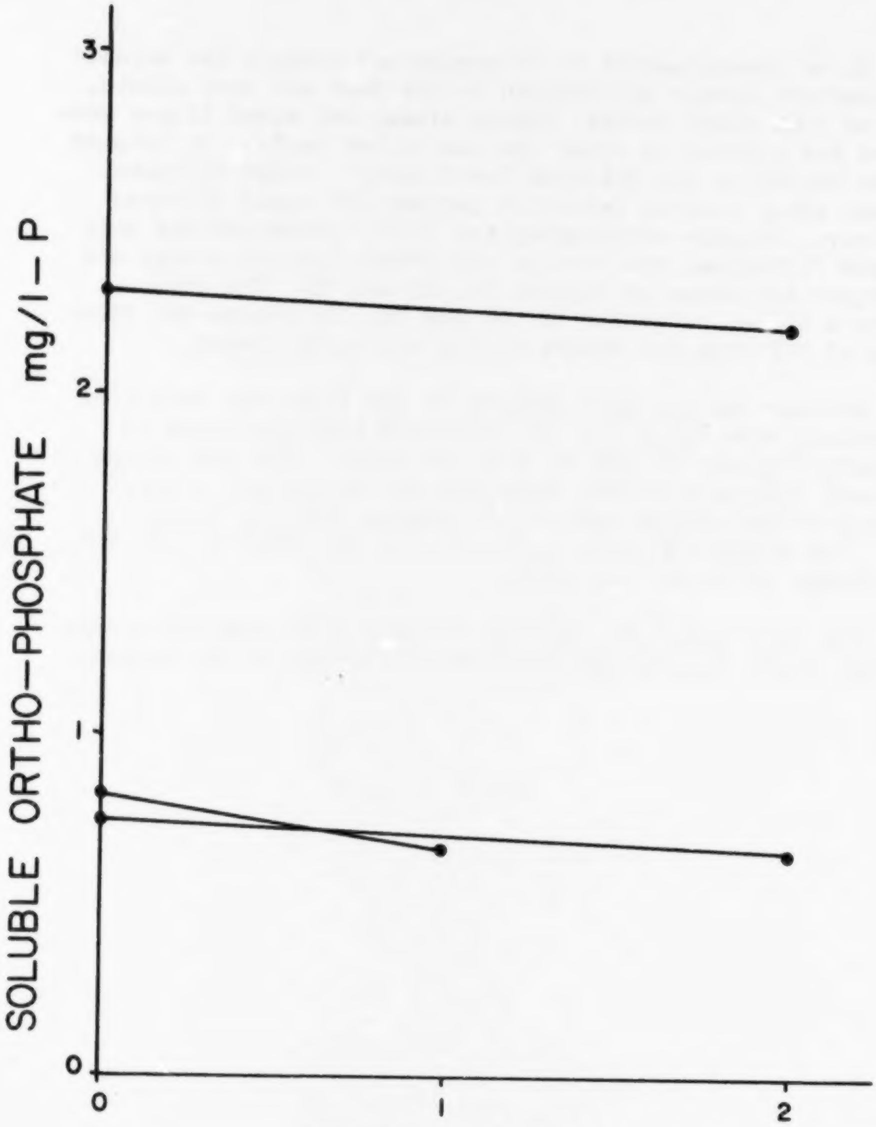
APPENDIX M

Uptake and Release of Soluble Ortho-Phosphate

In an investigation to determine and compare the soluble ortho-phosphate uptake and release in the East and West plants, samples of East plant sewage, return sludge and mixed liquor were collected and allowed to stand for one to two hours. An aliquot was taken initially and filtered immediately. Other aliquots were taken after various detention periods and again filtered immediately. Soluble ortho-phosphate (SOP) determinations were run on the filtrates, the results for sewage, return sludge and mixed liquor are shown on figures 21, 22 and 23. The data indicates a slight reduction in the SOP for the sewage and large releases of SOP from the return sludge and mixed liquor.

Another run was made similar to the first but this time the pH values were taken and the detention time increased to 3 1/2 hours (figures 24 and 25 show the data). The SOP concentrations again indicated slight reduction in the sewage, a large release from return sludge and slight release from the mixed liquor. The sewage pH value decreased and the mixed liquor and return sludge pH values increased.

The data indicates that any testing involving SOP uptake or release would require the immediate filtering of all samples taken.



TIME, HOURS

Figure 21

Sewage S O P Versus Time

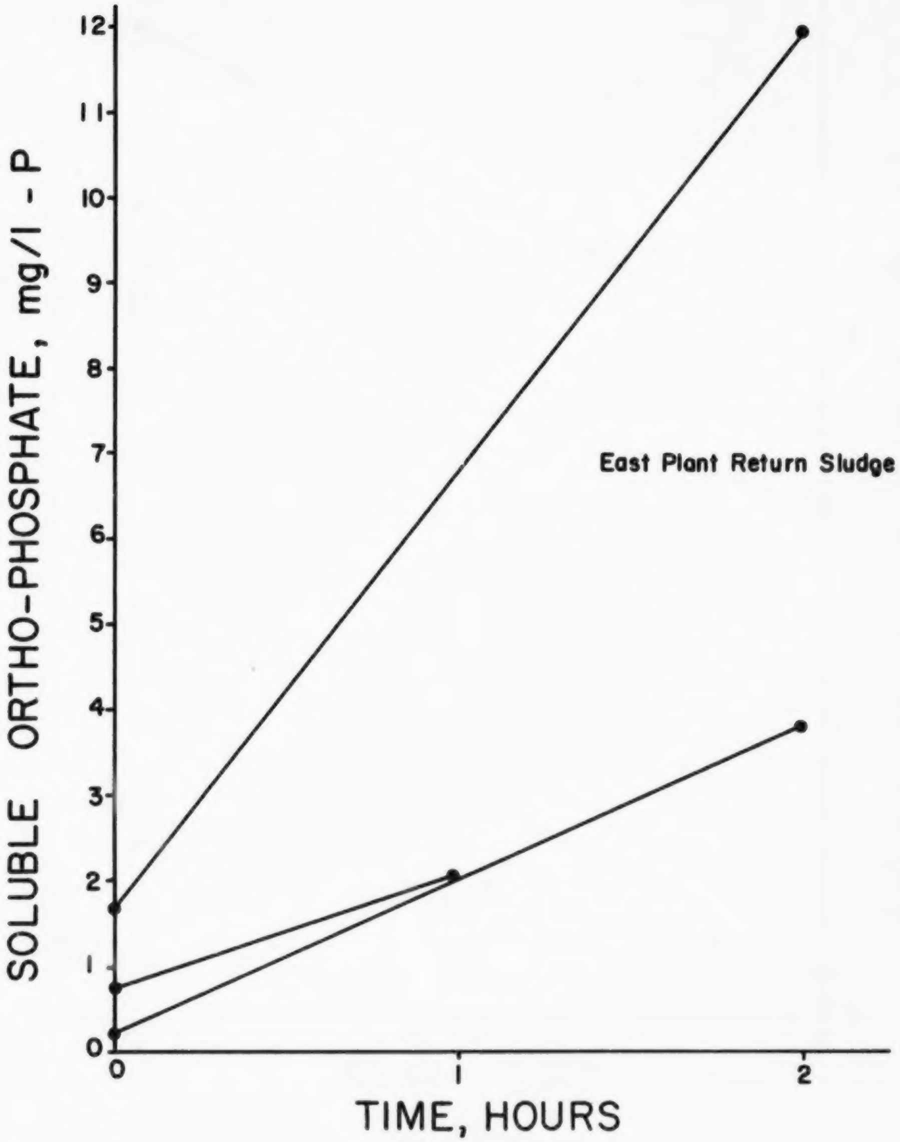


Figure 22

Sludge S O P Versus Time

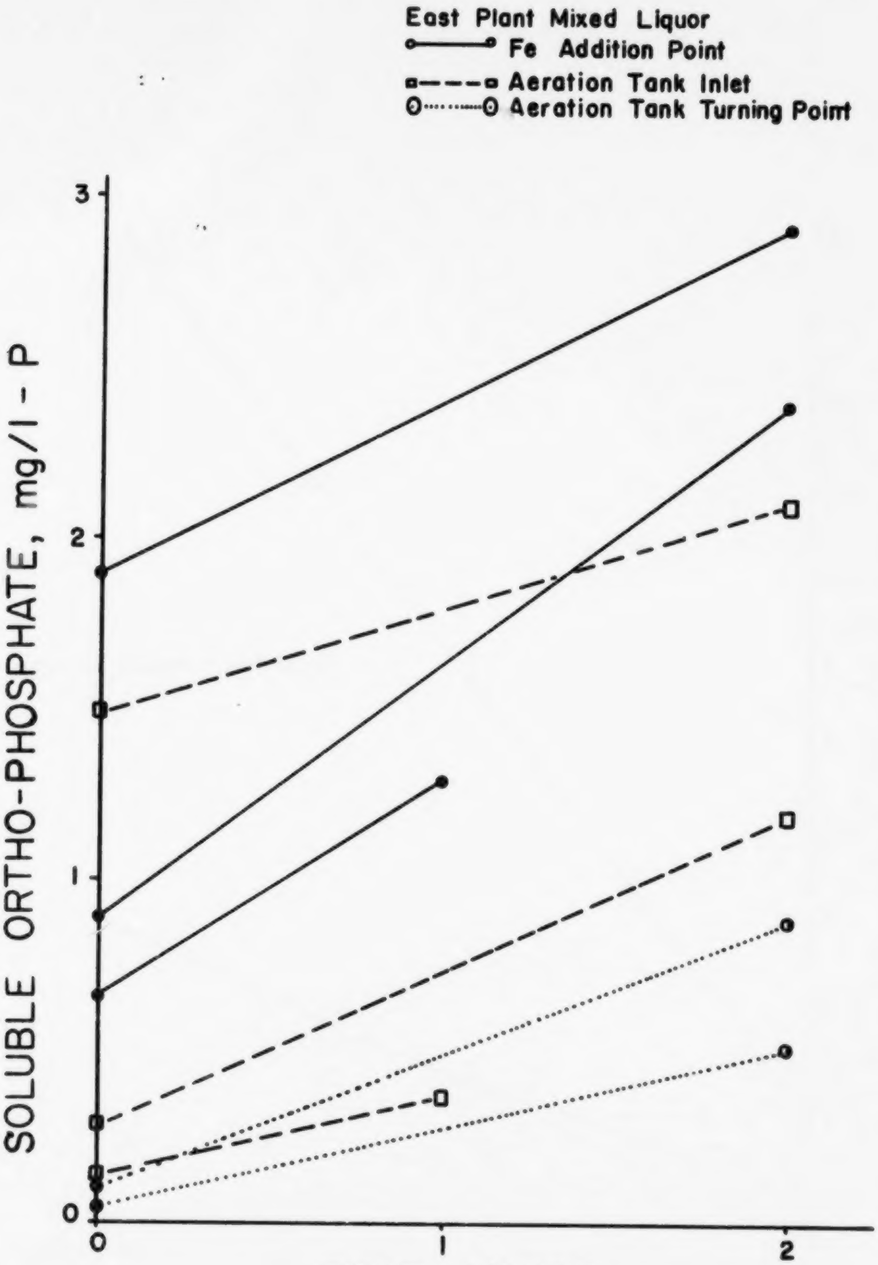


Figure 23

Mixed Liquor S O P Versus Time

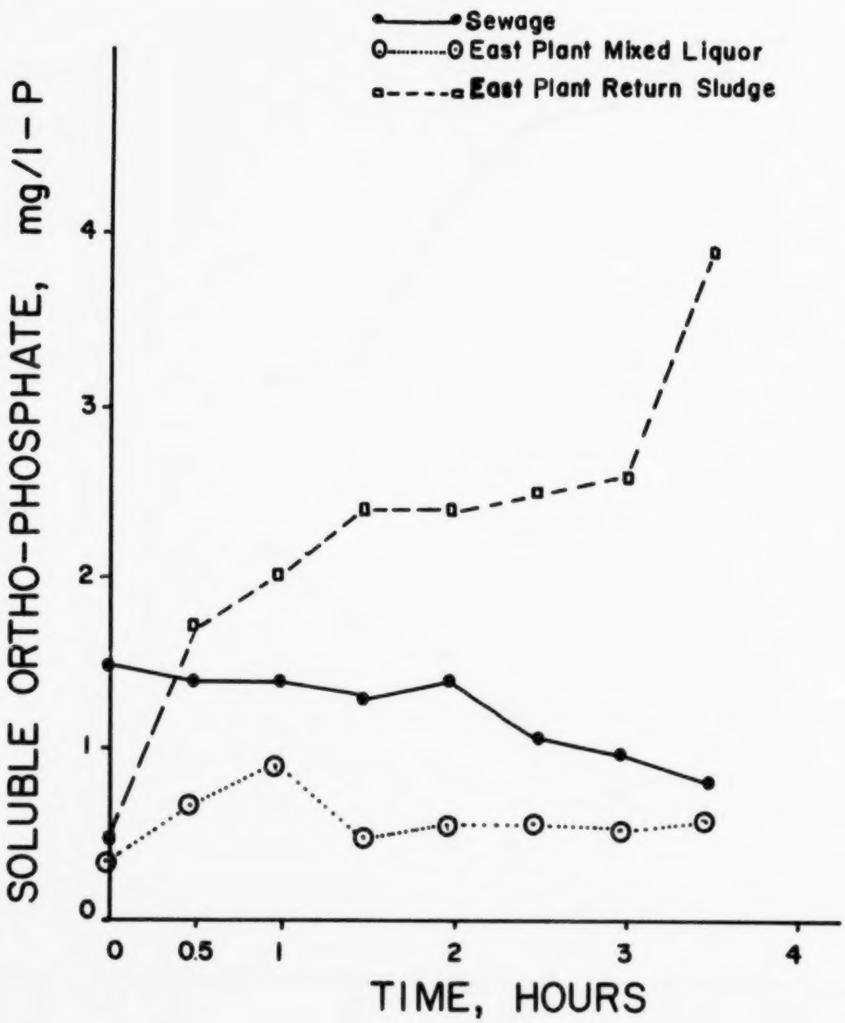


Figure 24

SOP Versus Time

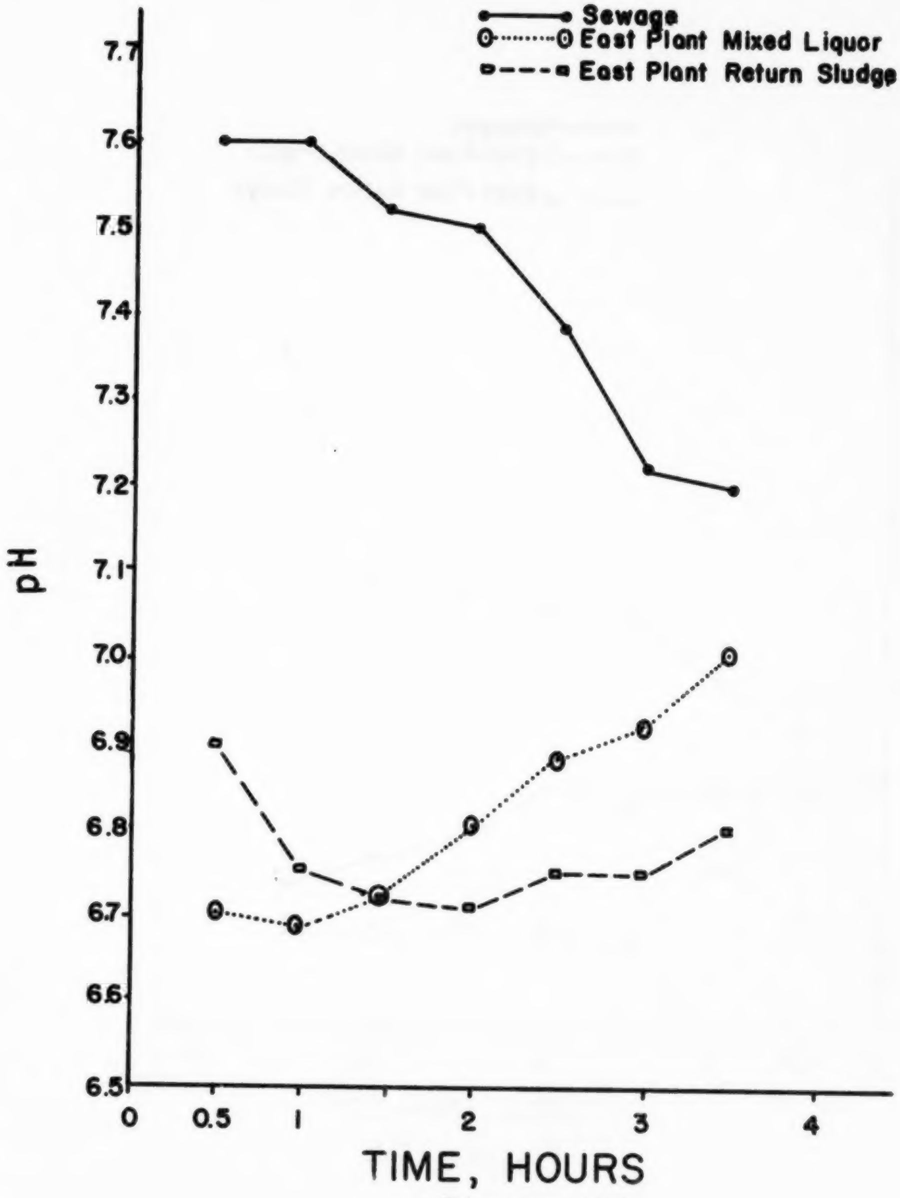


Figure 25
pH Versus Time

APPENDIX N

Mic-1-10/66/69

Date March 2, 1970

MICROSCOPIC COUNT OF MIXED LIQUOR PER MILLILITER AT 0.25% SOLIDS

/

10 Fields (200 PWR) Total Count x 200 = Count/ML
Solids diluted to 0.125%

	WEST M.L.	EAST M.L.
M.L. Temp.	53°	
Solids	0.202	0.232
Color	Med. Grey Brown	Med. Rust Brown
Supernatant	Sl.Turbid-some Susp.Floc	Sl.Turbid-some Susp.Floc

			W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	West	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	East
Peritrichia		Epistilis																						
		Opercularia					1						200					1			1			400
		Zoothanium																						
		Carchesium																						
		Vorticella	1		1			2	1	1		1	1400	2		5	1		4	2	1	4	1	4,000
Holotrichia		Colpoda-Colpidium																						
		Loxoplyllum					1						200											
		Chaenia																						
		Chilidon		1					1	1			600							1				200
Spirotrichia		Aspidisca																						
Hypotrichia -	Large	Euplotes			1	1		2		1	1	1	1400	1	1				1		1	2	1	1,400
	Small																							
Suctoria		Podophrya																						
Flagellates	Large	Euglena																						
		Astasia																						
	Small	Flagellates			1-3/Field								4000			4-6/Field								10,000
	Medium	Flagellates																						
Amoebina		Arcella																						
Rhizopoda		Difflugia																						
		Guttula																						
		Proteus																	1					1	400
Rotifers																								
Nematodes									1				(200											

	West	East
Algae%	Some Dinobryon	
Leptospira/Field		
Slime Molds,Small Amoeba Zooflagellates/Field		
Bacteria Background	Light to Med(mostly Fung Spores)	Same as West
Filament/Slime Ratio	2/98	2/98
Filament Length/Type	Short & Medium	Short & Medium
Type Floc %	Negl-Fila Gran-Normal Density	Same as West
Floc Size	10%pin-30%small;rest med.	Negl pin 10%small rest med.
Floc Connected %	20%	30%
Floc Thickness (Fluffy)	Non-Fluffy(Non 3-Dimentional)	Same as West
Floc Fragmentation%	10% - Granular Pin	Negligible
Microscopic Turbidity	Clear	Clear

Remarks

Heterogeneous,Conglomerate Floc
West Negligible
East 20%
(Thiocystis
Sulphur Bacteria (B. Gigas.etc
West Negligible
East Negligible

Negl. to Low	Leptothrix Sphaerotilis	Low few Clumps
	Natans "	
Negl. to Low	Free Zooglea, coarse	Low
Marked	Zooglea Ramigera	Marked
Negligible	Slime Clots, Zoogleal	10/10
1/20	*Ribbon-Conglom-Floc(B.Gigas)	1/20
5/10	Grease - Like Nodes	10/10
	% Actino Involved	20%
None	Nocardia Mycelia	None
None	Short Form	None
Marked	Fungus Fil. Large Type	Low
Low	Fiber Count	Low

Mic-1-10/66/69

APPENDIX N

Date April 29, 1970

MICROSCOPIC COUNT OF MIXED LIQUOR PER MILLILITER AT 0.25% SOLIDS

10 Fields (200 PWR) Total Count x 200 = Count/ML
Solids diluted to 0.125%

			WEST M.L.											EAST M.L.										
		M.L. Temp.	62°																					
		Solids	.33											.28										
		Color	Gray Brown																					
		Supernatant	Turbid some Susp. Floc											Sl. Turbid some Susp. Floc										
Peritrichia		Epistilis										1	200											
		Opercularia																						
		Zoothanium																						
		Carchesium																						
		Vorticella	2	1	1			1	1	2	1		1800		1		1							400
Holotrichia		Colpoda-Colpidium																						
		Loxoplyllum		1									200											
		Chaenia			1	1	1	1	2				1200			1								200
		Chilidon	1	1									400					1						200
Spirotrichia		Aspidisca	2		1						1		800											
Hypotrichia -	Large	Euplotes																						
	Small																							
Suctoria		Podophrya																						
Flagellates	Large	Euglena																						
		Astasia																						
	Small	Flagellates	1		2			1		2			1200											
	Medium	Flagellates																						
Amoebina		Arcella																						
Rhizopoda		Difflugia																						
		Guttula																						
		Proteus																						
Rotifers																								
Nematodes																								
Algae%																								

	WEST M.L.	EAST M.L.
Leptospira/Field	Negligible	Negligible
Slime Molds, Small Amoeba Zooflagellates/Field	Low	Low-Marked
Bacteria Background	Low-Marked (Most Spores)	Low-Marked (Most Spores)
Filament/Slime Ratio	2/98	1/99
Filament Length/Type	Medium - Long	Long - Clumped
Type Floc %	Negl. Fila Gran - Medium	Negl. Fila Gran - Medium
Floc Size	<10% Pin 10% Small	10% Pin
Floc Connected %	50%	80%
Floc Thickness (Fluffy)	Non Fluffy	Non Fluffy
Floc Fragmentation%	<10% Fila Gran Pin	10% Fila Gran Pin
Microscopic Turbidity	Clear	Clear

Remarks

Heterogeneous, Conglomerate Floc
West 20 - 30%
East 80%

(Thiocystis
Sulphur Bacteria (B. Gigas, etc
West Negligible
East Negligible

*Material Mostly Clumped

Negligible	Leptothrix Sphaerotilis	Negl.
Negligible	Natans "	Negl.
Low	Free Zooglea, coarse	Low
Negligible	Zooglea Ramigera	Negl.
5/10 Fld	Slime Clots, Zoogleal	*
Negligible	*Ribbon-Conglom-Floc (B. Gigas)	Negl.
4/10 Fld	Grease - Like Nodes	>6/10 Fld
	% Actino Involved	
Negligible	Nocardia Mycelia	Negl.
Marked	" Short Form	Low
Negligible	Fungus Fil. Large Type	Negl.
Negligible	Fiber Count	Negl.

APPENDIX N

Mic-1-10/66/69

Date June 18, 1970

MICROSCOPIC COUNT OF MIXED LIQUOR PER MILLILITER AT 0.25% SOLIDS

10 Fields (200 PWR) Total Count x 200 = Count/ML
Solids diluted to 0.125%

			WEST M.L.											EAST M/L.										
		M.L. Temp.	70°																					
		Solids	.293											.266										
		Color	Medium Gray Brown											Medium Brown										
		Supernatant	Turbid Some Susp Floc											Clear Negl Suspended Floc										
Peritrichia		Epistilis																						
		Opercularia																						
		Zoothanium																						
		Carchesium																						
		Vorticella	1					1		2	1		1000	3		2	1		1	3		4	1	3,000
Holotrichia		Colpoda-Colpidium																						
		Loxoplyllum				1							200											
		Chaenia		1			1		1			1	800		1	1		2		1		1		1,200
		Chilidon			1					1			400	1							1			400
Spirotrichia		Aspidisca	1					1					400		1			1	1			1		800
Hypotrichia -	Large	Euplotes				1				1		1	600	1		1	2			2	1		2	1,800
	Small																							
Suctoria		Podophrya																						
Flagellates	Large	Euglena														1								200
		Astasia																						
	Small	Flagellates			2-4 Field								6000											
	Medium	Flagellates																						
Amoebina		Arcella			1							1	400					1						200
Rhizopoda		Difflugia	1				1						400		1							1		400
		Guttula																						
		Proteus				1				1	1		600					1					1	400
Rotifers																								
Nematodes									1				200								1			200

	West	East
Algae%		
Leptospira/Field		
Slime Molds,Small Amoeba Zooflagellates/Field		
Bacteria Background	Very Light	Very Light
Filament/Slime Ratio	3/97	2/98
Filament Length/Type	Medium & Long	Medium & Long
Type Floc %	10% Fila 10% Small 60%Med	Negl.Fila-(Same as West)
Floc Size	70%of Floc Fila Gran-thin	(Same as West)
Floc Connected %	20%	20%
Floc Thickness (Fluffy)	Non	Non
Floc Fragmentation%	10% Fila-Gran Thin	10% Fila-Gran Thin
Microscopic Turbidity	Clear	

Remarks

Heterogeneous,Conglomerate Floc
West Negligible
East Low
(Thiocystis
Sulphur Bacteria (B. Gigas,etc
West Negligible
East Negligible

	Leptothrix Sphaerotilis	
	Natans "	
	Free Zooglea, coarse	Negl.
	Zooglea Ramigera	Negl.
	Slime Clots, Zoogleal	Some
	*Ribbon-Conglom-Floc(B.Gigas)	
3/10	Grease - Like Nodes	10/10
Negligible	% Actino Involved	10%
	Nocardia Mycelia	
	" Short Form	
Negligible	Fungus Fil. Large Type	Negl.
Negligible	Fiber Count	Negl.

APPENDIX N

Mic-1-10/66/69

Date August 10, 1970

MICROSCOPIC COUNT OF MIXED LIQUOR PER MILLILITER AT 0.25% SOLIDS

10 Fields (200 FWR) Total Count x 200 = Count/ML
Solids diluted to 0.125%

			WEST M.L.											EAST M.L.										
		M.L. Temp.	72°																					
		Solids	.217											.256										
		Color	Dark Grey Brown											Medium Red Brown										
		Supernatant	Slightly Turbid											Clear										
Peritrichia		Epistilis													4							18		4400
		Opercularia			24				4		6		6800				6							1200
		Zoothamium																						
		Carchesium																						
		Vorticella	1							1			400			1					1			400
Holotrichia		Colpoda-Colpidium																						
		Loxoplyllum																						
		Chaenia																						
		Chilidon		1				1		1			600	1			1		1					600
Spirotrichia		Aspidisca																						
Hypotrichia -	Large	Euplotes				1						1	400			1			1	1			1	800
	Small																							
Suctoria		Podophrya		1									200											
Flagellates	Large	Euglena																						
		Astasia																						
	Small	Flagellates			1-3/Field								4000											
	Medium	Flagellates																						
Amoebina		Arcella																						
Rhizopoda		Difflugia													1						2	1		800
		Guttula		1		1					1	1	800	1	1	2	1	4		1	2	1	1	2800
		Proteus	1		1	1		1	2	1	1		1600		1					1		1		600
Rotifers																								
Nematodes														1				2			1	1		1000
Algae%																								

	West M.L.	East M.L.
Leptospira/Field	Very High Count	Negligible
Slime Molds, Small Amoeba Zooflagellates/Field		
Bacteria Background	Low	Very Light
Filament/Slime Ratio	Negligible Filaments	Negligible Filaments
Filament Length/Type	Not Applicable	Not Applicable
Type Floc %	Floc Gran Hetero-Conglom	Floc Gran Hetero-Conglom
Floc Size	10%Pin/Small & Medium 70%	10%Pin,10%Small [illegible]
Floc Connected %	< 20%	> 20%
Floc Thickness (Fluffy)	Non-fluffy	Non-fluffy
Floc Fragmentation%	10% Granular	10% Granular
Microscopic Turbidity	Clear	Clear

Remarks
Heterogeneous, Conglomerate Floc
West > 90% Granular
East > 90% Granular
(Thiocystis
Sulphur Bacteria (B. Gigas, etc
West Marked Beg, Gigas, Spirulina & Thiocystis
East Negligible

	Leptothrix Sphaerotilis	
	Natans "	
High	Free Zooglea, coarse	Low
	Zooglea Ramigera	
1/10	Slime Clots, Zoogleal	
Marked	*Ribbon-Conglom-Floc(B.Gigas)	Negl.
10/10	Grease - Like Nodes	20/10
Negligible	% Actino Involved	Negl.
	Nocardia Mycelia	
	Short Form	
Low	Fungus Fil. Large Type	Low
Low	Fiber Count	Low

APPENDIX N

Mic-1-10/66/69

Date November 13, 1970

MICROSCOPIC COUNT OF MIXED LIQUOR PER MILLILITER AT 0.25% SOLIDS

10 Fields (200 PWR) Total Count x 200 = Count/ML
Solids diluted to 0.125%

			WEST M.L.											EAST M.L.										
		M.L. Temp.	67°F																					
		Solids	.334											.310										
		Color	Brown Grey											Brown Grey										
		Supernatant	Very Turbid Susp Floc											Turbid some Susp Floc										
Peritrichia		Epistilis																						
		Opercularia			2								400											
		Zoothanium																						
		Carchesium																						
		Vorticella	1							2			600											
Holotrichia		Colpoda-Colpidium																						
		Loxopiyllum																						
		Chaenia		1				1					400		1									200
		Chilidon							1				200											
Spirotrichia		Aspidisca			1		1					1	600	1						1				400
Hypotrichia -	Large	Euplotes								1			200				1							200
	Small																							
Suctoria		Podophrya																						
Flagellates	Large	Peranema Trichophorum								1	1		400					1			1		1	600
		Astasia																						
	Small	Flagellates																						
	Medium	Flagellates																						
Amoebina		Arcella		1									200						1			1		400
Rhizopoda		Difflugia						1					200	1		1					1			600
		Guttula															1			1		1		600
		Proteus			1		1			1	1		800		1	1			1				1	800
Rotifers								1					200				1							200
Nematodes				1									200					1				1		400

	WEST M.L.	EAST M.L.
Algae%		
Leptospira/Field		
Slime Molds, Small Amoeba Zooflagellates/Field		
Bacteria Background	Moderately Heavy	Light
Filament/Slime Ratio	3/97	2/98
Filament Length/Type	Medium Long Very Long	Not Exposed
Type Floc %	Fila-Gran-Open-Lacey-Light	Granular, Lacey
Floc Size	10% Pin to 20% x Large	10% Pin, 20% Small
Floc Connected %	30%	20%
Floc Thickness (Fluffy)	Fluffy	Non-Fluffy
Floc Fragmentation%	10%	10% Granular Pin
Microscopic Turbidity	Clear	Clear

Remarks		Leptothrix Sphaerotilis	
Heterogeneous, Conglomerate Floc		Natans "	
West =20%	Marked	Free Zooglea, coarse	High
East —		Zooglea Ramigera	
(Thiocystis		Slime Clots, Zoogleal	Low(but lge)
Sulphur Bacteria (B. Gigas, etc	Some	*Ribbon-Conglom-Floc(B.Gigas)	Low
West Some	10/10	Grease - Like Nodes	20/10
East Low	20%	% Actino Involved	20%
		Nocardia Mycelia	
	Marked	Short Form	Some
	Very Marked	Fungus Fil, Large Type	Marked
	Marked	Fiber Count	Marked

1 *Accession Number* **W**	2 *Subject Field & Group* 05D	**SELECTED WATER RESOURCES ABSTRACTS** **INPUT TRANSACTION FORM**

5 *Organization*

Sewerage Commission of the City of Milwaukee
Milwaukee, Wisconsin

6 *Title*

Phosphorus Removal with Pickle Liquor in an Activated Sludge Plant

10 *Author(s)*

Leary, Raymond D.
Ernest, Lawrence A.
Powell, Roland S.
Manthe, Richard M.

16 *Project Designation*

EPA WQO Project #11010 FLQ

21 *Note*

22 *Citation*

Proceedings of the Porcelain Enamel Institute Technical Forum, Volume 32, Page 103, 1970

23 *Descriptors (Starred First)*

*Activated Sludge, *Biological Treatment, *Chemical Precipitation, *Iron, *Phosphorus, *Waste Treatment, Ferrous Sulfate, Pickle Liquor, Phosphorus Removal, Sewerage Commission of the City of Milwaukee

25 *Identifiers (Starred First)*

27 *Abstract*

The Milwaukee Sewerage Commission's Jones Island Waste Water Treatment Plant consists of a mutual primary treatment facility followed by two separate activated sludge plants. To enhance phosphorus removal in the 115 MGD East Plant, spent hot sulfuric acid pickle liquor (ferrous sulfate) was added for a one year test period. The 85 MGD West Plant was operated as a control.

The major objective of the iron addition was to maintain an East Plant effluent total phosphorus concentration of 0.50 mg/l P. The East Plant effluent total phosphorus concentration during the 1970 project period from January 12 to December 31, 1970 averaged 0.70 mg/l P representing 91.3% removal. The East Plant effluent total soluble phosphorus concentration averaged 0.30 mg/l P or 90.7% removal. Modification and automation of the iron addition which was completed in December 1970 will further reduce East Plant soluble phosphorus residuals.

Comparison of the efficiencies of the West and East Plants in removing BOD, COD, and suspended solids as well as microscopic examination of the mixed liquors indicates that the addition of the unneutralized pickle liquor did not adversely affect purification.

Waste pickle liquor can be and is being utilized at the Milwaukee Jones Island Plant to enhance phosphorus removal.

bstractor Manthe, Richard M.	*Institution* Sewerage Commission of the City of Milwaukee

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